Determinants of Human Development Index in ASEAN Countries (2000-2019)

ဒီသုတေသနစာတမ်းမှာ သုံးထားတဲ့ **Research Methodology (သုတေသန နည်းလမ်း)** အကြောင်းကို အသေးစိတ် ရှင်းပြပေးပါမယ်။

၁။ သုတေသန၏ ရည်ရွယ်ချက်

ဒီသုတေသနရဲ့အဓိက ရည်ရွယ်ချက်က **ASEAN နိုင်ငံများရဲ့လူသားဖွံ့ဖြိုးရေးညွှန်းကိန်း (HDI)** ကို သက်ရောက်မှုရှိတဲ့ အကြောင်းရင်းများ (Determinants) ကို လေ့လာဖို့ ဖြစ်ပါတယ်။

၂။ ဒေတာ အမျိုးအစား

- **Panel Data (Cross-sectional Time-series Data)** ကို သုံးထားပါတယ်။
- **ဆိုလိုရင်း:** နိုင်ငံ ၁၀ နိုင်ငံ (Cross-section) ကို နှစ် ၂၀ (၂၀၀၀-၂၀၁၉) ကြာ လေ့လာထားတာဖြစ်ပါတယ်။
- **စုစုပေါင်း မှတ်တမ်းအရေအတွက်:** ၁၀ နိုင်ငံ × ၂၀ နှစ် = ၂၀၀ ခု

၃။ လေ့လာသော ကိန်းရှင်များ

(က) မှီခို ကိန်းရှင် (Dependent Variable)

- **Human Development Index (HDI)** – လူသားဖွံ့ဖြိုးရေးညွှန်းကိန်း

(ခ) လွတ်လပ် ကိန်းရှင်များ (Independent Variables)

၁. **Population Growth** – လူဦးရေ တိုးတက်မှုနှုန်း

၂. **Inflation Rate** – ငွေကြေးဖောင်းပွမှုနှုန်း

၃. **GDP per Capita** – တစ်ဦးချင်း ဝင်ငွေ

၄. **Unemployment Rate** – အလုပ်လက်မဲ့နှုန်း

၄။ အသုံးပြုထားသော စာရင်းအင်းနည်းလမ်းများ

(က) Pooled Ordinary Least Squares (Pooled OLS)

- **ဆိုလိုရင်း:** နိုင်ငံအားလုံးကို ပေါင်းပြီး တစ်ခါတည်း regression ရှာတဲ့ ရိုးရိုး OLS နည်းလမ်း

- **အားနည်းချက်:** နိုင်ငံတစ်ခုချင်းစီရဲ့ ကိုယ်ပိုင်လက္ခဏာတွေ (Individual Effects) ကို ထည့်သွင်းစဉ်းစားထားခြင်း မရှိ

(ခ) Fixed Effects Model (FEM)

- **ဆိုလိုရင်း:** နိုင်ငံတစ်ခုချင်းစီမှာ ကိုယ်ပိုင် Intercept (စမှတ်) ရှိတယ်လို့ ယူဆပြီး ခွဲခြမ်းစိတ်ဖြာတဲ့ နည်းလမ်း
- **အားသာချက်:** နိုင်ငံအလိုက် ကွာခြားချက်တွေကို ထိန်းချုပ်နိုင်
- **အားနည်းချက်:** ကာလအလိုက် မပြောင်းလဲတဲ့ အချက်တွေ (ဥပမာ - ယဉ်ကျေးမှု၊ ပထဝီအနေအထား) ကို တိုင်းတာလို့မရ

(ဂ) Random Effects Model (REM)

- **ဆိုလိုရင်း:** နိုင်ငံတစ်ခုချင်းစီရဲ့ ကွာခြားမှုကို Error Term (အမှားပါဝင်မှု) ထဲမှာ ထည့်သွင်းစဉ်းစားတဲ့ နည်းလမ်း
- **အားသာချက်:** Fixed Effects Model ထက် Efficient (ပိုမိုထိရောက်) ဖြစ်နိုင်
- **အခြေအနေ:** နိုင်ငံအလိုက် ကွာခြားမှုက ကျပန်းဖြစ်ပြီး လွတ်လပ်ကိန်းရှင်တွေနဲ့ ဆက်စပ်မှုမရှိမှ သုံးသင့်

၅။ မော်ဒယ် ရွေးချယ်ရန် စစ်ဆေးခြင်းများ

(က) Hausman Test

- **ရည်ရွယ်ချက်:** Fixed Effects Model vs Random Effects Model – ဘယ်မော်ဒယ်က ပိုသင့်တော်လဲဆိုတာ ဆုံးဖြတ်ဖို့
- **ဒီသုတေသနမှာ:** Hausman Test ရဲ့ ရလဒ်အရ Random Effects Model ကို ရွေးချယ်ထားပါတယ်။

(ခ) Breusch-Pagan Lagrange Multiplier (LM) Test

- **ရည်ရွယ်ချက်:** Random Effects Model သုံးသင့်/မသုံးသင့် စစ်ဆေးဖို့

- **ဒီသုတေသနမှာ:** LM Test ရလဒ်က Random Effects Model သုံးသင့်ကြောင်း အတည်ပြုထားပါတယ်။

(ဂ) Heteroscedasticity Test

- **ရည်ရွယ်ချက်:** Error Term (အမှားပါဝင်မှု) တွေရဲ့ Variance (ကွဲလွဲမှု) ညီမျှမှုရှိမရှိ စစ်ဆေးဖို့
- **ဒီသုတေသနမှာ:** Heteroscedasticity မရှိကြောင်း တွေ့ရပါတယ်။

(ဃ) Serial Correlation Test

- **ရည်ရွယ်ချက်:** Error Term တွေကြား အချိန်အလိုက် ဆက်စပ်မှုရှိမရှိ စစ်ဆေးဖို့
- **ဒီသုတေသနမှာ:** Serial Correlation ရှိကြောင်း တွေ့ရပါတယ်။

၆။ ခိုင်မာသော ခန့်မှန်းခြင်း နည်းလမ်း

Feasible Generalized Least Squares (FGLS)

- **အကြောင်းရင်း:** Serial Correlation နဲ့ Heteroscedasticity ပြဿနာတွေကို ဖြေရှင်းဖို့
- **ဒီသုတေသနမှာ:** FGLS ကို သုံးပြီး ပိုမိုတိကျတဲ့ ခန့်မှန်းချက်တွေ ရယူထားပါတယ်။

၇။ ရလဒ်များ (အကျဉ်းချုပ်)

- **Pooled OLS & FGLS:** Inflation Rate, GDP per Capita, Unemployment Rate တို့က HDI ကို သက်ရောက်မှုရှိကြောင်း တွေ့ရှိ
- **Fixed Effects Model:** GDP per Capita တစ်ခုတည်းသာ သက်ရောက်မှုရှိ
- **Random Effects Model:** GDP per Capita နဲ့ Unemployment Rate တို့က HDI ကို သက်ရောက်မှုရှိ
- **အဆုံးသတ်ရွေးချယ်မှု:** Random Effects Model ကို အဆုံးအဖြတ်ပေးထားပါတယ်။

၈။ ကောက်ချက်

ဒီသုတေသနမှာ **Panel Data Regression** ကို အခြေခံပြီး၊ **Fixed Effects** နဲ့ **Random Effects** မော်ဒယ်နှစ်ခုကို နှိုင်းယှဉ်စစ်ဆေးကာ၊ **Hausman Test** နဲ့ **LM Test** တို့အရ **Random Effects Model** က ပိုသင့်တော်ကြောင်း ဆုံးဖြတ်ထားတာကို တွေ့ရပါတယ်။ ဒီနည်းလမ်းက ASEAN နိုင်ငံများရဲ့ HDI ကို လွှမ်းမိုးတဲ့ အဓိက အကြောင်းရင်းများကို ယုံကြည်စိတ်ချရတဲ့ ခန့်မှန်းချက်တွေနဲ့ ရှာဖွေနိုင်ခဲ့ပါတယ်။

Panel Data Analysis မှာ အဓိက အသုံးပြုတဲ့ **Pooled OLS, Fixed Effects (FE), Random Effects (RE) နဲ့ Feasible Generalized Least Squares (FGLS)** မော်ဒယ်တွေရဲ့ အသုံးဝင်မှု၊ အားသာချက်နဲ့ အားနည်းချက်တွေကို ဇယားနဲ့ အသေးစိတ် ရှင်းပြပေးပါမယ်။

Panel Data Regression Models Comparison

Model	အဓိပ္ပါယ်	အသုံးဝင်မှု	အားသာချက်များ	အားနည်းချက်များ
Pooled OLS	ဒေတာအားလုံးကို ပေါင်းပြီး ရိုးရိုး OLS နည်းနဲ့ ခန့်မှန်းခြင်း	- ရိုးရှင်းတဲ့ မော်ဒယ် - စတင်လေ့လာသူများ နားလည်လွယ် - Individual effects မရှိသော ကိစ္စရပ်များ	- တွက်ချက်ရလွယ်ကူ - Interpretation ရိုးရှင်း	- Individual effects ကို ထည့်သွင်းမစဉ်းစား - Omitted Variable Bias ဖြစ်နိုင် - **Panel data ရဲ့ သဘောသဘာဝကို မဖမ်းစား**
Fixed Effects (FE)	နိုင်ငံ/အဖွဲ့အလိုက် ကိုယ်ပိုင် intercept ရှိသည်ဟု ယူဆခြင်း	- Individual-specific effects ကို ထိန်းချုပ်လိုသော အခါ - Unobserved time-invariant factors ရှိလျှင်	- Omitted Variable Bias ကို ကာကွယ် - Individual effects ကို control လုပ်နိုင် - Consistent estimator	- Time-invariant variables (ဥပမာ - လိင်၊ မျိုးရိုး) ကို တိုင်းတာလို့မရ - Degrees of freedom လျော့နည်း - Inefficient (if individual effects are random)
Random Effects (RE)	Individual effects ကို error term ထဲတွင်	- Individual effects နဲ့ independent variables ကြား ဆက်စပ်မှုမရှိလျှင်	- Time-invariant variables ကို estimate လုပ်နိုင် - Fixed Effects ထက်	- Individual effects နဲ့ independent variables

	ကျပန်းအဖြစ် ထည့်သွင်းခြင်း	- Time-invariant variables ပါ ခန့်မှန်းလိုလျှင်	efficient ဖြစ် - Degrees of freedom မလျော့	ဆက်စပ်နေရင် biased (Hausman test နဲ့စစ်)
Feasible Generalized Least Squares (FGLS)	Heteroskedasticity နဲ့ serial correlation ပြဿနာများကို ဖြေရှင်းသည့် မော်ဒယ်	- Panel data တွင် heteroskedasticity နှင့် autocorrelation ရှိလျှင် - Efficient estimates လိုအပ်လျှင်	- Heteroskedasticity နဲ့ autocorrelation ကို ကိုင်တွယ်နိုင် - OLS ထက် efficient ဖြစ်	- Implementation ပိုရှုပ်ထွေး - Small samples တွင် ကောင်းမွန်စွာ အလုပ်မလုပ်နိုင် - Assumptions များစွာ လိုအပ်

ဘယ်မော်ဒယ်ကို ဘယ်အချိန်မှာ သုံးမလဲ?

Scenario	**Recommended Model**	**Reason**
Individual effects မရှိဟု ယုံကြည်လျှင်	**Pooled OLS**	ရိုးရှင်းမှု
Individual effects ရှိပြီး time-invariant variables ကို estimate လုပ်ရန် မလိုလားလျှင်	**Fixed Effects (FE)**	Omitted variable bias ကို ရှောင်ရှား
Individual effects ရှိပြီး time-invariant variables ကို estimate လုပ်လိုလျှင်	**Random Effects (RE)**	Efficiency နှင့် time-invariant variables ကို estimate လုပ်နိုင်မှု
FE vs RE ရွေးချယ်ရန်	**Hausman Test**	FE နှင့် RE estimates များ ကွဲလွဲမှု ရှိ/မရှိ စစ်ဆေး
Heteroskedasticity/Autocorrelation ရှိလျှင်	**FGLS**	Efficient and consistent estimates ရရှိရန်

သိထားရမည့် အချက်များ

- **Fixed Effects** က "within" estimator လို့လဲ ခေါ်ပါတယ်။ အဖွဲ့အတွင်း ပြောင်းလဲမှုကို ကြည့်တာဖြစ်ပါတယ်။
- **Random Effects** က "between" estimator လို့လဲ ခေါ်ပါတယ်။ အဖွဲ့ချင်းကြား ကွာခြားမှုကိုပါ ထည့်တွက်တာဖြစ်ပါတယ်။

- **FGLS** က OLS ရဲ့ပြဿနာတွေကို ဖြေရှင်းဖို့အတွက် error structure ကို ပြင်ဆင်ခန့်မှန်းပြီး ခန့်မှန်းတဲ့ နည်းလမ်းဖြစ်ပါတယ်။

ဒီဇယားနဲ့ ရှင်းပြချက်တွေက Pooled OLS, FE, RE, နဲ့ FGLS တို့ရဲ့ကွာခြားချက်တွေကို နားလည်သဘောပေါက်စေဖို့ ကူညီပေးနိုင်မယ်လို့ မျှော်လင့်ပါတယ်။

Panel Data Analysis လုပ်တဲ့အခါ သိထားသင့်တဲ့ အရေးကြီးတဲ့ အချက်တွေကို အစုံလိုက် ရှင်းပြပေးပါမယ်။

Panel Data Analysis မှာ သိထားသင့်တဲ့ အရေးကြီးအချက်များ

၁။ Data Structure နဲ့ ပြင်ဆင်မှု

အချက်	အဓိပ္ပါယ်	သတိထားရန်
Balanced vs Unbalanced Panel	- **Balanced**: unit တိုင်းမှာ time periods အရေအတွက် အတူတူ - **Unbalanced**: time periods အရေအတွက် မတူ	Unbalanced panel ကို handle လုပ်ရန် software setting ပြင်ဆင်ရမည်
Wide vs Long Format	- **Wide**: variable တိုင်းကို time period တိုင်းအတွက် ကော်လံခွဲထား - **Long**: ကော်လံအနည်းငယ်နဲ့ time variable ထည့်ထား	Panel analysis အတွက် **Long Format** ကို သုံးရမည်
Missing Data	တချို့ unit တွေ/time တွေမှာ data ပျက်နေခြင်း	- Imputation methods သုံးနိုင် - Software က automatically handle လုပ်နိုင်

၂။ Diagnostic Tests အရေးကြီးပုံ

Test	ရည်ရွယ်ချက်	ဘာလုပ်သင့်လဲ
Hausman Test	FE vs RE ရွေးချယ်ရန်	- p < 0.05 → Fixed Effects - p > 0.05 → Random Effects
Breusch-Pagan LM Test	Pooled OLS vs RE ရွေးချယ်ရန်	- p < 0.05 → Random Effects - p > 0.05 → Pooled OLS

Wooldridge Test	Serial Correlation စစ်ဆေးရန်	- p < 0.05 → autocorrelation ရှိ - FGLS or Cluster Robust SE သုံးရန်
Breusch-Pagan/Cook-Weisberg	Heteroskedasticity စစ်ဆေးရန်	- p < 0.05 → heteroskedasticity ရှိ - Robust standard errors သုံးရန်

၃။ Standard Errors ရွေးချယ်မှု

Type	**အသုံးဝင်မှု**	**အားသာချက်**
Conventional SE	Homoskedasticity ရှိလျှင်	ရိုးရှင်းမှု
Robust SE	Heteroskedasticity ရှိလျှင်	Heteroskedasticity ကို ခံနိုင်ရည်ရှိ
Cluster-Robust SE	Within-unit correlation ရှိလျှင်	Serial correlation နဲ့ heteroskedasticity ကို ခံနိုင်ရည်ရှိ

၄။ Dynamic Panel Data Models

Model	**အသုံးဝင်မှု**	**Estimation Method**
Arellano-Bond GMM	Lagged dependent variable ပါလျှင်	Difference GMM
System GMM	Persistent data series များအတွက်	Level + Difference GMM

သတိထားရန်: Dynamic models မှာ **instrument validity tests** (Hansen test, AR(2) test) လုပ်ရန်လိုအပ်

၅။ Common Problems & Solutions

Problem	**လက္ခဏာ**	**Solution**
Endogeneity	Independent variables နဲ့ error term ဆက်စပ်နေ	- Fixed Effects - Instrumental Variables - GMM
Multicollinearity	VIF > 10	- Variables ဖယ်ရန် - Transformation လုပ်ရန်
Unit Root	Data များ non-stationary ဖြစ်နေ	- Unit root tests (Levin-Lin-Chu, etc.) - First difference လုပ်ရန်

၆။ Software Implementation Tips

stata

** အောက်ပါ commands များကို သိထားသင့်*

```
xtset country_code year        // Panel data သတ်မှတ်ခြင်း
xtdes                          // Panel structure ကြည့်ခြင်း
xtsum                          // Panel summary statistics
xtreg y x1 x2, fe              // Fixed Effects
xtreg y x1 x2, re              // Random Effects
hausman fe re                  // Hausman Test
xttest0                        // Breusch-Pagan LM Test
xtserial y x1 x2               // Wooldridge Test
```

၇။ Interpretation လုပ်ရာမှာ သတိထားရန်

- **Fixed Effects:** "Within-unit" ပြောင်းလဲမှုကို ခန့်မှန်းသည်
- **Random Effects:** "Between-unit" ကွာခြားမှုကိုပါ ထည့်တွက်သည်
- **Time Fixed Effects:** ခုနှစ်အလိုက် သက်ရောက်မှုများကို ထိန်းချုပ်နိုင်

၈။ Best Practices

1. **Always start with descriptive analysis** - xtsum, xtdes နဲ့ စတင်ပါ
2. **Test appropriate model** - Hausman test မလုပ်ဘဲ model မရွေးပါနဲ့
3. **Check assumptions** - Heteroskedasticity, autocorrelation tests လုပ်ပါ
4. **Use robust standard errors** - Cluster-robust SE က ပိုစိတ်ချရသည်
5. **Interpret results carefully** - Coefficients က within-unit effect လား between-unit effect လား ခွဲခြားပါ

ဒီအချက်တွေက Panel Data Analysis လုပ်တဲ့အခါ ရှောင်ရမယ့် အချက်တွေ၊ လုပ်သင့်တဲ့ step တွေကို နားလည်စေမှာပါ။

YANGON UNIVERSITY OF ECONOMICS

DEPARTMENT OF STATISTICS

MASTER OF APPLIED STATISTICS PROGRAMME

DETERMINANTS OF HUMAN DEVELOPMENT INDEX IN ASEAN COUNTRIES (2000 - 2019)

NYUNT NYUNT THEIN OO

MAS – 21

MAS 2nd BATCH

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DETERMINANTS OF HUMAN DEVELOPMENT INDEX IN ASEAN COUNTRIES (2000-2019)

This thesis is submitted to the Board of Examination as partial fulfillment of the requirements for the Degree of Master of Applied Statistics

Approved by the Board of Examiners

Supervised by:

Daw Aye Aye Htwe
Associate Professor
Department of Statistics
Yangon University of Economics

Submitted by:

Nyunt Nyunt Thein Oo
MAS - 21
MAS 2nd Batch

July, 2022

ABSTRACT

Human Development Index is one indicator of development progress on aspects of human quality in a country. HDI is about giving people more freedom to live they value. This study aims to determine the factor that effect the human development index in nations in ASEAN member countries. The analysis technique used is regression by using panel data regression with fixed effect model. The results of processing with random effects model show that population growth, inflation rate, Gross Domestic Product (GDP) per capita and unemployment rate effects the human development index (HDI) in ASEAN member countries, while the variable rate of inflation does not have an impact on the HDI. This study implies the importance of government to control the consumer price index (CPI) change in the economy as a whole. The key set of panel data used in this paper cover the ASEAN countries and the studied period is from 2000 to 2019.As for constructing the model for human development, OLS method is adopted. In this study the fixed effect model inflation rate, GDP per capita and unemployment rate are statistically significant at 5% level. The result in the random effect GLS regression model two variables are statistically significant. In this study Breusch and Pagan Lagrange Multiplier Test, it can be concluded that there is random individual difference among ASEAN Countries and that the random effect model is appropriate. In this study inflation rate, GDP per capita and unemployment rate are impact on HDI in ASEAN countries.

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ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
CPI	Consumer Price Index
GDP	Gross Domestic Product
GNP	Gross National Income
HDI	Human Development Index
HDR	Human Development Report
PPP	Purchasing Power Purity
WTO	World Trade Organization
OLS	Ordinary Least Square

CHAPTER I
INTRODUCTION

United Nations Development Programme (UNDP) had introduced human development index (HDI) in 1990. The HDI was created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone. The HDI can also be used to question national policy choices, asking how two countries with the same level of Gross National Income (GNI) per capita can end up with different human development outcomes.

1.1 Rationale of the Study

The Human Development Index (HDI) created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone. Human development is about expanding the richness of human life rather than simply the richness of the economy in which human beings live. It is an approach that is focused on people and their opportunities and choices.

Up till Mid-1980s, national progress was measured by Gross National Income (GNP) alone. The total Gross Domestic Product (GDP) shares of three main sectors may not equal to 100%, as some ASEAN Member States (AMS) recorded “balance items for GDP”, such as values of tax revenues and subsidies separated from the calculations of total values GDP. The results confirmed the positive relationship between trade and human development. There is also positive relationship between GDP and human development.

In 1990 the first Human Development report introduced a new approach for advancing human wellbeing. Human Development of the human development approach is about expanding the richness of human life, rather than simply the richness of the economy in which human beings live. It is an approach that is focused on people and their opportunities and choices.

Human development focuses on improving the lives people lead rather than assuming that economic growth will lead, automatically, to greater wellbeing for all. Income growth is seen as a means to development, rather than an end in itself.

Human development is about giving people more freedom to live lives they value. In effect this means developing people's abilities and giving them a chance to use them. For example, educating a girl would build her skills, but it is of little use if she is denied access to jobs, or does not have the right skills for the local labour market. Three foundations for human development are to live a long, healthy and creative life, to be have access to resources needed for a decent standard of living.

Many other things are important too, especially in helping to create the right conditions for human development. Once the basics of human development are achieved, they open up opportunities for progress in other aspects of life.

In addition to poverty and income inequality, Human Development Index (HDI) is another important indicator for measuring the social well-being of a country's population. HDI is a composite index focusing on the three basic dimensions of human development: (1) the ability to lead a long and healthy life as measured by life expectancy at birth: (2) the ability to acquire knowledge as measured by mean years of schooling and expected years of schooling; (3) and the ability to achieve a decent standard of living as measured by gross national income per capita (UNDP 2018).

UNDP's human development approach-with its emphasis on enlarging people's freedoms and opportunities rather than economic growth-has inspired and informed solutions and policies across the world.

Human development data, analysis and reporting have been at the heart of that paradigm. UNDP's Human Development Index (HDI) has captured human progress, combining information on people's health, education and income in just one number. Over the years, the HDI has served as a comparative tool of excellence, and as a reliable platform for vigorous public debates on national priorities.

Progress in the social wellbeing of ASEAN population can be monitored, among others, by examining the extent to which the AMS (ASEAN Member States) reduces the incidence of poverty as well as income inequality. This demographic transition leads to increases in the shares of youth and working-age population, albeit at different stages of transitions among ASEAN Member States (AMS).

By using panel data from the ASEAN Countries, this study will analyze the population, Inflation rate, Gross Domestic Product GDP (per capita (tonnes) & Kg per 2011 PPP $ of GDP) and unemployment rate are especially on human development as measured by the Human Development Index (HDI).

Human development is, fundamentally, about more choice. It is about providing people with opportunities, not insisting that they make use of them. No one can guarantee human happiness, and the choices people make are their own concern. The process of development – human development - should at least create an environment for people, individually and collectively, to develop to their full potential and to have a reasonable chance of leading productive and creative lives that they value.

The aim of this study is to examine the factors that affecting the human development index in ASEAN countries, which consist of 10 countries. For this aim, panel regression with fixed effect was used. This research find that population and per capita income growth rate have an effect on the human development index in ASEAN member countries. While the variable rate of inflation and unemployment rate does not affect the human development index. This research would suggest several policy recommendations that can applied for the ASEAN countries that still in medium human development index.

As the international community moves toward implementing and monitoring the 2030 agenda, the human development approach remains useful to articulating the objectives of the development and improving people's well-being by ensuring an equitable, sustainable and stable planet.

1.2 Objectives of the Study

The objectives of the study are:

(1) To study the HDI trends and rank changes of HDI among ASEAN Countries during the studied period.

(2) To analyze the relationship between HDI and some economic indicators in ASEAN Countries.

(3) To find out the appropriate model of HDI in ASEAN Countries.

1.3 Method of Study

In this Study, the descriptive statistics were used to describe be the condition of HDI and some economic indicator of ASEAN countries. More emphasis was panel data analysis (Fixed Effect model, Random Effect Model) applied to examine the effects of some economic indicators or HDI. Hausman test will be used to choose the appropriate model of HDI and some economic indicators.

1.4 Scope and Limitations of the Study

This study focused on HDI and some economic indicator of ASEAN member countries over the period covering from year 2000 to year 2019. The secondary data were gotten from the world Bank.

1.5 Organization of the Study

This study has been organized into five chapters. Chapter I mentions rationale of the study, objectives of the study, method of the study, scope and limitations of the study and organization of the study. Chapter II present Overview of HDI and some economic indicators in ASEAN countries. Theoretical background of panel data analysis models have been described in Chapter III. The effects of economic indicators on HDI have been examined in Chapter IV. Conclusion was presented in Chapter V.

CHAPTER II
OVERVIEWS OF HDI AND SOME INDICATORS IN ASEAN COUNTRIES

In this chapter presents about the situation of human development index in ten ASEAN Countries and indicators from 2000 to 2019 which are taken from the World Data Bank source. Development is a means of community welfare. The development of a country effort is carried out consciously and institutionally. Then the development will be loaded with values, namely with the desire to create a better condition. (Rusli,2014). Humans have a significant role in developing a country or region and are always associated with economic growth. If a country has quality human resources, it will contribute to economic growth.

2.1 Original of ASEAN Countries

The original ASEAN logo presented five brown sheaves of rice stalks, one for each founding member. by Beneath the sheaves is the legend “ASEAN” in blue. These are set on a field of yellow encircled by a blue border. Brown stands for strength and stability, yellow for prosperity and blue for the spirit of cordiality in which ASEAN affairs are conducted. When ASEAN celebrated it 52^{th} Anniversary in 2019, the sheaves on the logo had increased to ten-representing all ten countries of Southeast Asia and reflecting the colors of the flags of all of them. In a very real sense, ASEAN and Southeast Asia would then be one and the same, just as the founding fathers had envisioned.

The ASEAN's economy through updated data on GDP - both total values and per capita, GDP growth and GDP by main economic sectors in AMS and ASEAN as a total. Gross Domestic Products (GDP) measures the value of all final goods and services produced in a country or region over a particular period of time.

The HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. A long and healthy life is measured by life expectancy.

Knowledge level is measured by mean years of education among the adult population, which is the average number of years of education received in a life-time by people aged 25 years and older; and access to learning and knowledge by expected years of schooling for children of school-entry age, which is the total number of years of schooling a child of school-entry age can expect to receive if prevailing patterns of age-specific enrolment rates stay the same throughout the child's life. Standard of living is measured by Gross National Income (GNI) per capita expressed in constant 2011 international dollars converted using purchasing power parity (PPP) conversion rates.

There are also being affected by, and are affecting international institutions such as the World Trade Organization (WTO). The WTO's education in turn is altering the policy options of developing and transition economics. Furthermore, the ability of those countries to influence the WTO is being to increase.

2.1.1 Member of ASEAN Countries

The Association of Southeast Asia Nations (ASEAN) was founded in 1967 with the initial members of Indonesia, Malaysia, the Philippines, Singapore and Thailand, Brunei became a member of ASEAN in 1984. Vietnam joined ASEAN in 1995, Myanmar and Laos followed suit in 1997 and Cambodia was accepted as a member in 1999. Now, ASEAN has become the organization which represents all 10 Southeast Asia Nations.

ASEAN has made tremendous economic progress over the recent decades. With current combined gross domestic products (GDP) of almost US$ 2.99 trillion (2997833.7) in 2020, ASEAN is now collectively ranked as the world 5th largest and Asian 3rd largest economy. This chapter presents an overview of the ASEAN's economy through updated data on GDP - both total values and per capita, GDP growth and GDP by main economic sectors in ASEAN member States (AMS) and ASEAN as a total.

Population covers the total number of people living in the ten member states (ASEAN), spread over a land area of 4.5 million Sq.km. Currently ASEAN will become the third-largest population in the world after China and India. Over the period of 2000-2019, ASEAN population increased. The new doubling in the population size was due to natural increases as well as membership expansion, the

latter with the accession of Brunei Darussalam to ASEAN in 1984, Viet Nam in 1995, Lao PDR and Myanmar 1997, and Cambodia in 1999.

Changes in the population structure over time indicates the ongoing process of demographic transition, associated with declining fertility and mortality levels in ASEAN member states (AMS). However, different levels of development across the AMS led to the variation in the stages of their demographic transitions. On the other hand, challenges may also arise in terms of allocating resources for providing education as well as health services, and creating sufficient employment opportunities. Total population; De facto population in a Country, area or region as of 1 July. Population average annual growth; Average annual exponential growth rate for the period specified. Urban Population; De facto Population living in areas classified as Urban according to the criteria used by each Country or area as 1 July.

Gross Domestic Product (GDP) is the total value of all final goods and services produced in the economy during a year. Real GDP is the value of all final goods and services at constant producers' prices.

Growth rate of GDP is the growth of the real GDP of an economy over time.

$$GDP = O - MS$$

where O = Value of gross output

MS = Value of Intermediate inputs (material and services)

$$\text{GDP per capita} = Y_1 - Y_0$$

where Y_1 = Value of current year

Y_0 = Value of base year

Real GDP per Head and Growth Rate

Real GDP per Head is real GDP per person. It is computed by dividing total real GDP by total population for a given year.

$$\text{Real GDP per head} = \frac{\text{Real GDP}}{\text{Total Population}}$$

$$\text{Growth rate of GDP per head} = \frac{X_1 - X_0}{X_0} \times 100$$

Where X_1 = GDP per head for current year

X_0 = GDP per head for base year

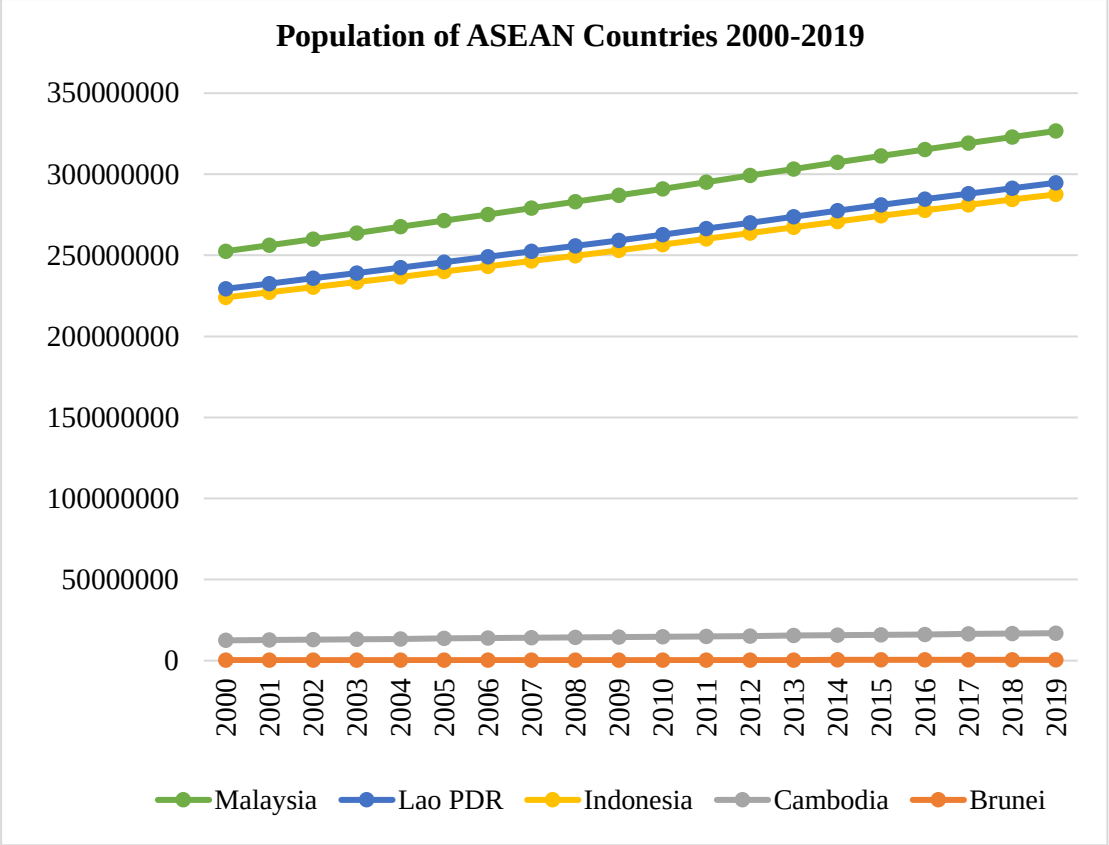
Inflation rate, often expressed as a percentage, inflation is the rate at which the general price level of goods and services increases over a period of time. Inflation makes everything you buy more expensive, so the value of your money decreases. While day-to-day the spending power of a dollar seems to remain the same, over long periods of time, the value of currency can increase or decrease. As the price of goods in an economy increases, the buying power of an individual dollar (or euro, pound, yen, etc.) decreases proportionally in a process known as inflation. In an inflating economy, the buying power of currency decreases as overall prices increase.

The Unemployment rate (fully) is defined as the number of Unemployed persons divided by the labor for in a particular region, such as a state or country. The Unemployment rate is the percentage of total workforce that is Unemployed and is looking for Unemployment. The Unemployment rate is one of the most closely watched statistics because a rising rate indicates a weak economy.

Table (2.1) Population of ASEAN Countries (2000-2019)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia
2000	333166	12155241	211513822	5323701	23194252
2001	340037	12405411	214427419	5409584	23709115
2002	346777	12637719	217357790	5493247	24208391
2003	353295	12856171	220309473	5576640	24698821
2004	359434	13066475	223285666	5662199	25190647
2005	365112	13273355	226289468	5751675	25690615
2006	370262	13477705	229318262	5846075	26201954
2007	374967	13679953	232374239	5944950	26720367
2008	379418	13883835	235469755	6046630	27236003
2009	383902	14093605	238620554	6148621	27735038
2010	388634	14312205	241834226	6249168	28208028
2011	393687	14541421	245115988	6347564	28650962
2012	398997	14780454	248451714	6444527	29068189
2013	404414	15026330	251805314	6541302	29468923
2014	409778	15274506	255128076	6639763	29866606
2015	414914	15521435	258383257	6741160	30270965
2016	419791	15766290	261556386	6845848	30684652
2017	424481	16009413	264650969	6953031	31104655
2018	428960	16249795	267670549	7061498	31528033
2019	433296	16486542	270625567	7169456	31949789

Source: World Development Indicators, World data Bank



Source: Table (2.1)

Figure (2.1) Population of ASEAN Countries 2000-2019

According to Table (2.1) the population of Brunei in 2000 was estimated at 333166 an increase of 26268 over the year 2004 population of 359434, in 2009 was estimate at 383902 an increase of 25876 over the year 2014 population of 409778 and then an increase of 23518 over the year 2019 population of 433296.

The population of Cambodia in 2000 was estimated at 1215241 an increase of 911234 over the year 2004 population of 13066475 and then, in 2009 was estimated at 14093605 an increase of 1180901 over the year 2014 population of 15274506 after, an increase of 1212036 in thousand over the year 2019 population of 16486542. The population of Indonesia in 2000 was estimated at 211513822 an increase of 11771844 over the year 2004 population of 223285666 and then, in 2009 was estimated at 238620554 an increase of 16507517 over the year 2014 population of 255128071 after, an increase of 15497496 over the year 2019 population of 270625567.

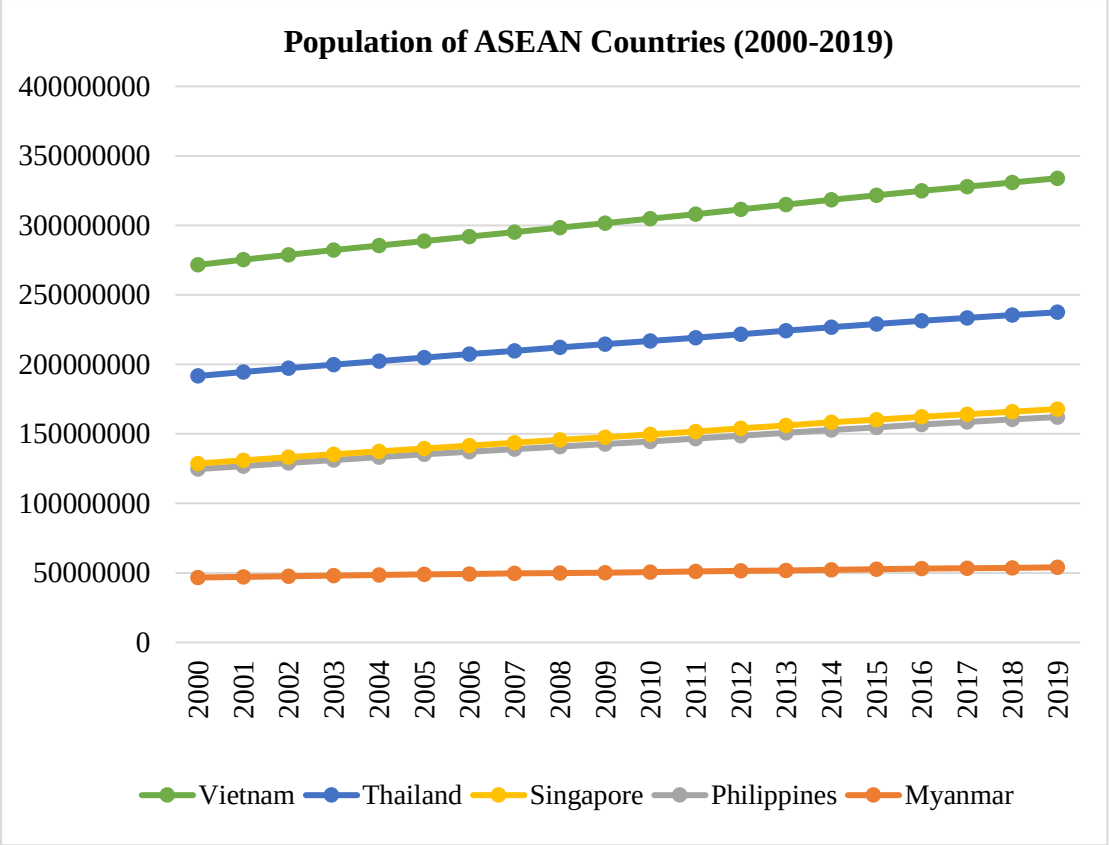
The population of Lao PDR in 2000 was estimated at 5323701 an increase of 338498 over the year 2004 population of 5662199 and then, in 2009 was estimated at 6148621 an increase of 491142 over the year 2014 population of 6639763 after, an

increase of 529693 over the year 2019 population of 7169456. The population of Malaysia, in 2000 was estimated at 23194252 an increase of 1996395 over the year 2004 population of 25190647 and then, in 2009 was estimated at 27735038 an increase of 2131568 over the year 2014 population of 29866606 after, an increase of 2083183 over the year 2019 population of 31949789.

Table (2.2) Population of ASEAN Countries (2000-2019)

Year	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	46719698	77991757	4027887	62952639	79910411
2001	47225119	79672869	4138012	63539190	80742500
2002	47702163	81365260	4175950	64069093	81534406
2003	48148907	83051970	4114826	64549867	82301650
2004	48564489	84710544	4166664	64995303	83062819
2005	48949931	86326251	4265762	65416189	83832662
2006	49301049	87888675	4401365	65812540	84617545
2007	49621479	89405482	4588599	66182064	85419588
2008	49929642	90901967	4839396	66530980	86243424
2009	50250366	92414161	4987573	66866834	87092250
2010	50600827	93966784	5076732	67195032	87967655
2011	50990612	95570049	5183688	67518379	88871384
2012	51413703	97212639	5312437	67835969	89801926
2013	51852464	98871558	5399162	68144519	90752593
2014	52280816	100513137	5469724	68438748	91713850
2015	52680724	102113206	5535002	68714519	92677082
2016	53045199	103663812	5607283	68971313	93640435
2017	53382521	105172921	5612253	69209817	94600643
2018	53708318	106651394	5638676	69428454	95545959
2019	54045422	108116622	5703569	69625581	96462108

Source: World Development Indicators, World data Bank



Source: Table (2.2)

Figure (2.2) Population of ASEAN Countries (2000-2019)

According to Table (2.2) the population of Myanmar in 2000 was estimated at 46719698 an increase of 1844791 over the year 2004 population of 48564489, in 2009 was estimate at 50250366 an increase of 2030450 over the year 2014 population of 52280816 and an increase of 1764606 over the year 2019 population of 54045422.

The population of Philippines in 2000 was estimated at 77991757 an increase of 6718787 over the year 2004 population of 84710544, in 2009 was estimate at 92414161 an increase of 8098976 over the year 2014 population of 100513137 and an increase of 7603485 over the year 2019 population of 108116622.

The population of Singapore in 2000 was estimated at 4027887 an increase of 110125 over the year 2001 population of 4138012, in 2002 was estimate at 4175950 a decrease of 61124 over the year 2003 population of 4114826, in 2004 was estimate at 4166664 an increase of 820909 over the year 2009 population of 4987573 and in 2014 was estimate at 5469724 an increase of 233845 over the year 2019 population of 5703569.

The population of Thailand in 2000 was estimated at 62952639 an increase of 2042664 over the year 2004 population of 64995303, in 2009 was estimate at 66866834 an increase of 1571944 over the year 2014 population of 68438748 and an increase of 1186833 over the year 2019 population of 69625581. The population of Vietnam in 2000 was estimated at 79910411 an increase of 3152408 over the year 2004 population of 83062819, in 2009 was estimate at 87092250 an increase of 4621600 over the year 2014 population of 91713850 and an increase of 4748258 over the year 2019 population of 96462108.

Population Growth

Population growth is the change in a population over time, and can be quantified as the change in the number of individuals of any species in a population using "per unit time" for measurement. Population Growth is defined as the increase in the number of individuals in a population is called population growth. Three factors determine population growth. Population growth is the increase in the number of people in a population or dispersed group.

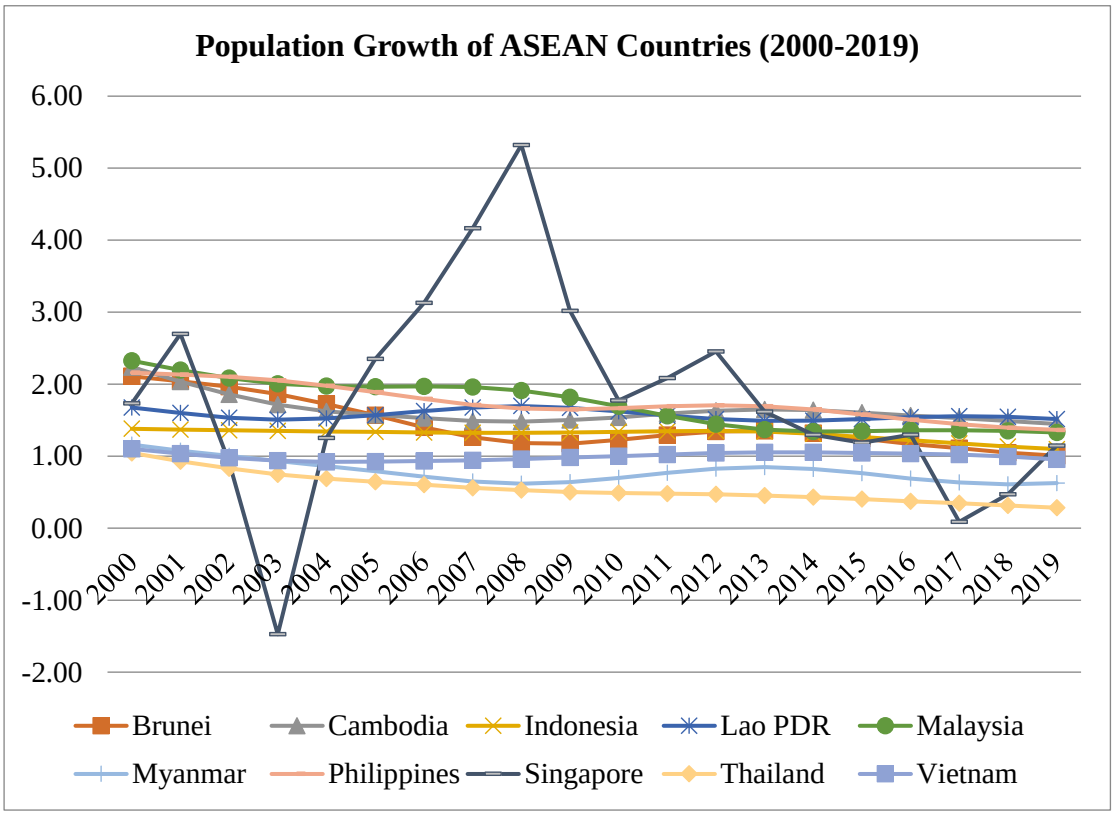
Table (2.3) Population Growth (annual %) of ASEAN Countries (2000- 2019)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	2.11	2.24	1.38	1.67	2.32	1.16	2.16	1.73	1.04	1.10
2001	2.04	2.04	1.37	1.60	2.20	1.08	2.13	2.70	0.93	1.04
2002	1.96	1.86	1.36	1.53	2.08	1.01	2.10	0.91	0.83	0.98
2003	1.86	1.71	1.35	1.51	2.01	0.93	2.05	-1.47	0.75	0.94
2004	1.72	1.62	1.34	1.52	1.97	0.86	1.98	1.25	0.69	0.92
2005	1.57	1.57	1.34	1.57	1.97	0.79	1.89	2.35	0.65	0.92
2006	1.40	1.53	1.33	1.63	1.97	0.71	1.79	3.13	0.60	0.93
2007	1.26	1.49	1.32	1.68	1.96	0.65	1.71	4.17	0.56	0.94
2008	1.18	1.48	1.32	1.70	1.91	0.62	1.66	5.32	0.53	0.96
2009	1.17	1.50	1.33	1.67	1.82	0.64	1.65	3.02	0.50	0.98
2010	1.23	1.54	1.34	1.62	1.69	0.70	1.67	1.77	0.49	1.00
2011	1.29	1.59	1.35	1.56	1.56	0.77	1.69	2.08	0.48	1.02
2012	1.34	1.63	1.35	1.52	1.45	0.83	1.70	2.45	0.47	1.04
2013	1.35	1.65	1.34	1.49	1.37	0.85	1.69	1.62	0.45	1.05
2014	1.32	1.64	1.31	1.49	1.34	0.82	1.65	1.30	0.43	1.05
2015	1.25	1.60	1.27	1.52	1.34	0.76	1.58	1.19	0.40	1.04
2016	1.17	1.57	1.22	1.54	1.36	0.69	1.51	1.30	0.37	1.03
2017	1.11	1.53	1.18	1.55	1.36	0.63	1.45	0.09	0.35	1.02
2018	1.05	1.49	1.13	1.55	1.35	0.61	1.40	0.47	0.32	0.99
2019	1.01	1.45	1.10	1.52	1.33	0.63	1.36	1.14	0.28	0.95

Source: World Development Indicators, World data Bank

Population Growth Calculation

To calculate the Population Growth (PG) we find the difference (subtract) between the initial population and the population at Time 1, then divide by the initial population and multiply by 100.



Source: Table (2.3)

Figure (2.3) Population Growth of ASEAN Countries (2000-2019)

2.2 Human Development Index (HDI)

Human development index is the geometric mean of the composite index for each of the three dimensions, i.e., a long and healthy life, access to knowledge and a decent standard of living.

Health dimension is measured by life expectancy at birth, which is number of years a newborn infant could expect to live if prevailing patterns of age-specific mortality rates at the time of birth stay the same throughout the infant's life.

Education dimension is measured by expected years of schooling and Mean years of schooling. Expected years of schooling is number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates persist throughout the child's life. Mean years of schooling is

average number of years of education received by people ages 25 and older, converted from education attainment levels using official durations of each level.

What does HDI measure?

Achievement of human development, in terms of longevity, knowledge and standard of living.

What is HDI purpose?

1. To assess progress made in achieving development objective using very few items of information.
2. To alert policy markers / planners that improvement is not taking place over time and in relation to other countries.

Is HDI gender sensitive?

Yes, it can be if the values for longevity, literacy, education and income are adjusted for gender disparity. However, there could be serious data problems.

Is HDI an aggregate indicator or a set of indicators?

It is an aggregate indicator. For each of the four component indicators, a country's position is placed along a scale from 0 to 1 and then a simple mean of these indicators is taken.

Are we measuring inputs or outputs?

We are measuring output in the sense of achievement by a society. For example, longevity measures the success of a society to meet a development goal of living for as long a possible.

Are we measuring only quantity or is quality also taken into account?

It may appear that only quantity is measured, but in reality it is possible to adjust the value of each of the four indicators to take account of other qualitative factors, for example, values can be adjusted to reflect gender, distribution, environment or any other concern, Again, the mean years of schooling could be adjusted by a quality of schooling factor, of longevity would be adjusted by a morbidity factor.

Are the indicators or direct or indirect measures of progress?

The difference difficult to spell out, life expectancy, adult literacy, mean years of schooling and income level represent individually and collectively achievement of progress in specific things. But they also represent an increase in functioning capacity of individuals in the society, which is indirectly measured. According to UNDP (2013) the human development index (HDI) is a comparative measurement of life expectancy, literacy, education and living standards for all countries around the world. HDI is used to classify whether a country is a developed country, a developing country or undeveloped country and also to measure the influence of economic policy on quality of life.

In addition to poverty and income inequality, Human Development Index (HDI) is another important indicator for measuring the social well-being of a country's population. HDI is a composite index focusing on the three basic dimensions of human development:

(1) the ability to lead a long and healthy life as measured by life expectancy at birth:

(2) the ability to acquire knowledge as measured by mean years of schooling and expected years of schooling: and

(3) the ability to achieve a decent standard of living as measured by gross national income per capita (UNDP 2018). The Human Development Index (HDI) provides a single index measure to capture three key dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. The HDI utilizes four key metrics:

- life expectancy at birth – to assess a long and healthy life
- expected years of schooling – to assess access to knowledge of the young generation
- average years of schooling – to assess access to knowledge of the older generation
- gross national income (GNI) per capita – to assess the standard of living

There are two steps to calculating the HDI:

1. **Forming indices for each of the four metrics**
   - Values of each of the four metrics are first normalized to an index value of 0 to 1. To do this, "goalposts" of the maximum and minimum limits on each metrics are, as shown in the table.
   - With the actual value for a given country, and the global maximum and minimum, the dimension (indices) value for each metric is calculated as:
   - The dimension index is therefore 1 in a country that achieves the maximum value and it is 0 for a country that is at the minimum value.

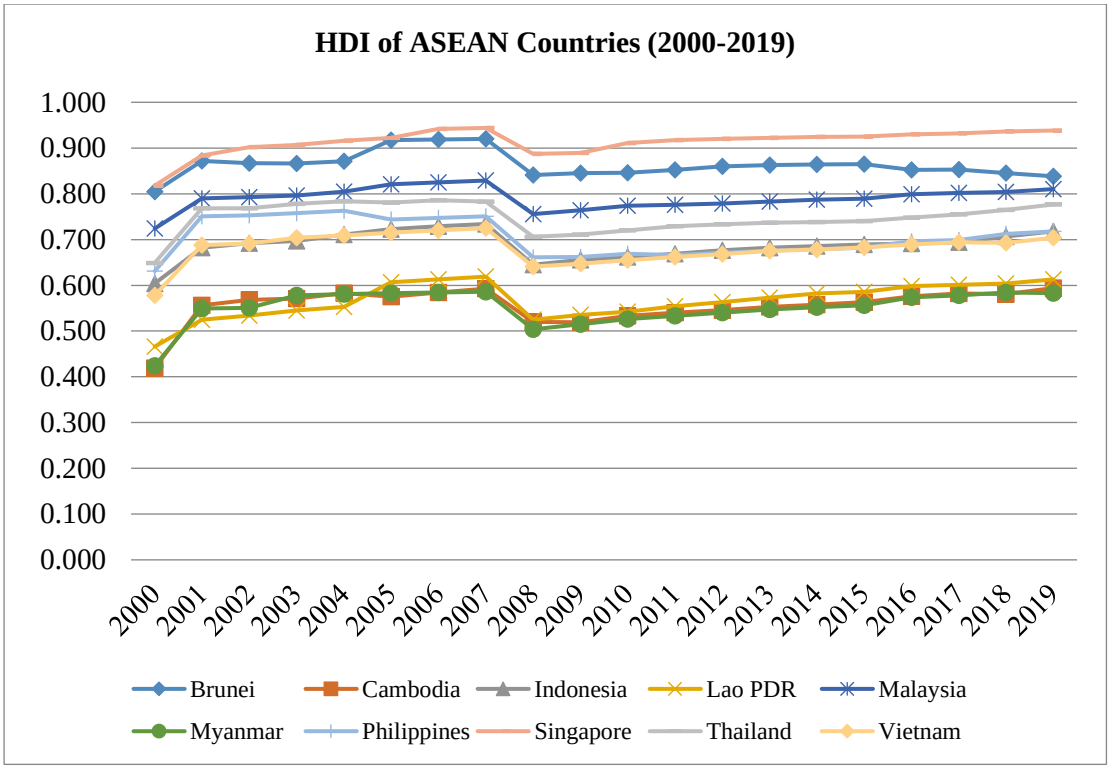
2. **Aggregating the four metrics to produce the HDI**
   - Once each of the individual indices have been calculated, they are aggregated to calculate the HDI.
   - The HDI is calculated as the geometric mean (equally-weighted) of life expectancy, education, and GNI per capita.
   - Five key findings emerge from the analysis:
     1. Most people today live longer, are more educated and have more access to goods and services than ever before. But the quality of human development reveals **large deficits**. Living longer does not automatically mean more years spent **enjoying life**. Being in school longer does not automatically translate into equivalent **capabilities and skills**. So shifting the focus towards the quality of human development will be important in monitoring **future progress**.
     2. Progress is not linear or guaranteed, and **crises and challenges can reverse gains**. **Countries** experiencing **conflict** show HDI losses, which can be felt for generations.
     3. Going beyond the average achievements, the IHDI and disaggregated assessments reveal **large inequalities** across **human development dimensions**. When the HDI is adjusted for inequalities, the **global HDI value falls 20 percent**-from 0.728 to 0.582. (2017)
     4. **Women have a lower HDI value than men** across regions and face particular barriers to empowerment all through life.

5. **Environmental degradation** puts human development gains at risk, as evident from carbon dioxide emissions, deforestation, fresh water withdrawals and the like.

Table (2.4) Human Development Index of ASEAN Countries from 2000- 2019

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	0.805	0.419	0.604	0.466	0.724	0.424	0.631	0.818	0.649	0.578
2001	0.806	0.434	0.61	0.471	0.722	0.432	0.634	0.822	0.657	0.586
2002	0.809	0.453	0.616	0.48	0.724	0.441	0.639	0.83	0.665	0.594
2003	0.815	0.466	0.623	0.488	0.731	0.451	0.643	0.839	0.674	0.603
2004	0.82	0.478	0.629	0.496	0.734	0.46	0.653	0.846	0.683	0.612
2005	0.824	0.49	0.633	0.505	0.732	0.47	0.656	0.869	0.693	0.616
2006	0.827	0.502	0.643	0.511	0.738	0.479	0.657	0.872	0.694	0.624
2007	0.827	0.516	0.644	0.521	0.751	0.49	0.663	0.879	0.71	0.632
2008	0.828	0.521	0.648	0.528	0.762	0.501	0.667	0.884	0.714	0.639
2009	0.831	0.524	0.659	0.539	0.766	0.512	0.666	0.885	0.718	0.65
2010	0.846	0.533	0.662	0.543	0.774	0.526	0.669	0.911	0.720	0.655
2011	0.852	0.54	0.669	0.554	0.776	0.533	0.666	0.917	0.729	0.662
2012	0.86	0.546	0.677	0.563	0.779	0.54	0.671	0.92	0.733	0.668
2013	0.863	0.553	0.682	0.573	0.783	0.547	0.676	0.922	0.737	0.675
2014	0.864	0.558	0.686	0.582	0.787	0.552	0.679	0.924	0.738	0.678
2015	0.865	0.563	0.689	0.586	0.789	0.556	0.682	0.925	0.74	0.683
2016	0.852	0.576	0.691	0.598	0.799	0.574	0.696	0.93	0.748	0.689
2017	0.853	0.582	0.694	0.601	0.802	0.578	0.699	0.932	0.755	0.694
2018	0.845	0.581	0.707	0.604	0.804	0.584	0.712	0.935	0.765	0.693
2019	0.838	0.594	0.718	0.613	0.810	0.583	0.718	0.938	0.777	0.704

Source: World Development Indicators, World data Bank.



Source: Table (2.4)

Figure (2.4) Human Development Index of ASEAN countries (2000- 2019)

According to the Table (2.4) in all countries human development index improved, but rank is varied changes. In 2000 Singapore was already in the high human development category, was more than that of Brunei. As for Indonesia, Malaysia, Philippines and Thailand are concerned they moved. Theirs HDI values were above 0.600 in 2000, moved to above 0.700 in 2019 but Malaysia HDI value is above 0.800 begin 2017. Also, the same features occur in the other three countries such as Myanmar, Cambodia and Lao PDR. Theirs HDI values were above 0.400 in 2000, as for Myanmar, it HDI values was 0.584 in 2018 after become to HDI values was 0.583 in 2019 a little decrease more than 2018 because this suggestion can be risk, per capita of income is decreased, inflation rate is increase so GDP per capita is decrease so HDI is decrease for Myanmar.

2.2.1 Consumer Price Index (CPI)

The Consumer Price Index measures the average change in the retail prices of goods and services purchased and consumed. It is computed base on 2010 “Household Expenditure Survey” conducted in Yangon by the Central Statistical Organization. All goods and services purchased and consumed are grouped into six

major categories and goods and services for computing the CPI are selected on the basis of their importance and representativeness for the respective groups.

The CPI is computed using Lapser's formula

$$CPI = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

Where, p_1 = Price in the base period for a commodity

p_0 = Price in the current period for that commodity

q_0 = Quality in the base period for that commodity

What is Price Data?

Pricing data refers to exchange-traded, data for all financial assets.

What is price relative in statistics?

A price relative is the ratio of the price of a specific product in one period to the price of the same product in some other period.

Why the price important in economics?

Price acts as a signal for shortages and surpluses which help firms and consumers respond to changing market conditions. If a good is in shortage-price will tend to rise. Rising prices discourage demand, and encourage firms to try and increase supply.

What is price fluctuation?

Price fluctuation is a frequents rise and fall of commodity prices in the price fluctuation can be seasonal whereby prices of commodities changes during certain season of the year due to the increase in supply and demand.

What does the price index measure?

The Consumer Price Index (CPI) is a measure of the average change over time in the prices paid by consumers for a market basket of consumer goods and services.

What are the uses of consumer price index?

CPI can be used to calculate the cost of living of the people of a country and also the changes in the purchasing power of the currency of nation. CPI detects the price changes of the items falling under the common basket and by averaging those prices.

2.3 Inflation Rate

Inflation as measured by the annual growth rate of the gross domestic product implicit deflator show the rate of price change in the economy as a whole. The gross domestic product implicit deflator is the ratio of gross domestic product in current local currency to gross domestic product in constant local currency.

Three Types of Inflation

Inflation is classified into three types; Demand-Pull inflation, Cost-Push inflation, and Built-In inflation.

1. Demand-Pull Inflation :

Demand-pull inflation is a situation where consumer demand for goods and services in an economy persistently exceeds the available supply when the economy is near or at full employment. This results in a demand-supply gap with higher demand and a shortage in supply, causing prices to go up. Demand-pull inflation is caused by excess demand, which can originate from high exports, strong investment, a rise in money supply, or government financing its spending by borrowing.

2. Cost-Pull Inflation:

Cost-push inflation is a result of the increase in the overall prices of production process inputs. For example, an increase in the cost of labor and/or raw material will lead to higher overall production costs. If the cost of making a product increases, then to stay profitable, businesses need to increase their prices accordingly. Sometimes, companies may even seize the opportunity to grow their profit margins. The more price inelastic the demand for their goods, the less likely such behavior will lead to a fall in demand for their products.

3. Built-In Inflation

Built-in inflation occurs as the price of goods and services increases along with the demand for higher wages in order to maintain the cost of living. Any upsurge in the labor wages would then result in the basket of goods and services getting more expensive, triggering a cost-pull inflation. This wage-price spiral goes on as increases in one lead to increases in the other, and so on.

Higher taxes

If the government put up taxes, this will lead to higher prices.

Declining productivity

If firms become less productive and allow costs to rise, this invariably leads to higher prices.

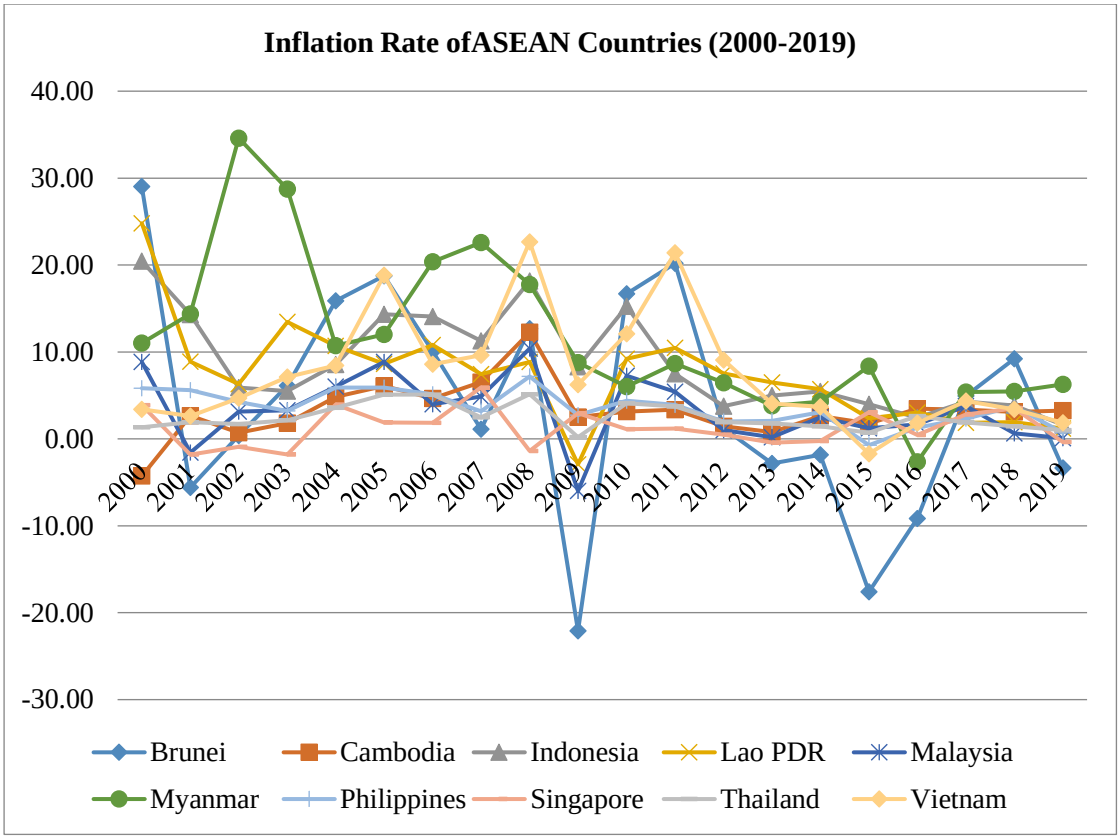
Profit push inflation

When firms push up prices to get higher rates of inflation. This is more likely to occur during strong economic growth.

Table (2.5) Inflation Rate (GDP) period 2000 to 2019 of ASEAN Countries (%)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	29.02	-4.28	20.45	24.80	8.86	11.03	5.82	3.86	1.33	3.41
2001	-5.59	2.65	14.30	8.87	-1.58	14.37	5.62	-1.81	1.92	2.62
2002	0.37	0.71	5.90	6.32	3.13	34.61	4.23	-0.90	1.69	4.70
2003	6.10	1.80	5.49	13.45	3.30	28.72	3.19	-1.80	2.15	7.11
2004	15.89	4.82	8.55	10.69	6.01	10.72	5.89	3.96	3.57	8.43
2005	18.77	6.08	14.33	8.64	8.86	12.01	5.91	1.90	5.09	18.81
2006	10.05	4.63	14.09	10.81	3.98	20.37	5.11	1.84	5.10	8.57
2007	1.12	6.52	11.26	7.44	4.88	22.59	3.16	5.92	2.47	9.63
2008	12.69	12.25	18.15	8.86	10.39	17.76	7.18	-1.38	5.13	22.67
2009	-22.09	2.50	8.27	-2.93	-5.99	8.76	2.74	2.95	0.19	6.22
2010	16.69	3.12	15.26	9.20	7.27	6.03	4.37	1.11	4.08	12.07
2011	20.18	3.36	7.47	10.47	5.41	8.68	3.92	1.17	3.74	21.42
2012	1.22	1.44	3.75	7.53	1.00	6.44	1.99	0.50	1.91	9.08
2013	-2.82	0.78	4.97	6.47	0.17	3.80	2.06	-0.43	1.78	4.04
2014	-1.85	2.63	5.44	5.73	2.47	4.27	3.05	-0.27	1.44	3.70
2015	-17.61	1.79	3.98	2.35	1.22	8.37	-0.72	3.07	0.72	-1.72
2016	-9.17	3.48	2.44	3.02	1.66	-2.65	1.28	0.44	2.64	1.82
2017	4.95	3.34	4.29	1.85	3.78	5.37	2.32	2.80	1.90	4.36
2018	9.22	3.11	3.82	1.92	0.62	5.45	3.74	3.51	1.43	3.41
2019	-3.34	3.24	1.60	1.20	0.07	6.27	0.70	-0.36	1.00	1.86

Source: World Development Indictors, World Data Bank



Source: Table (2.5)

Figure (2.5) Inflation Rate of ASEAN Countries (2000-2019)

According to the Table (2.5) all ASEAN countries inflation rate are the first Brunei's inflation rate is negative affect at 2001, 2009, 2013, 2014, 2015, 2019.Cambodia's inflation rate is negative effect at 2000 but begin 2001 to 2019 inflation rate are positive effect. Lao's inflation rate was negative affect at 2009 and Malaysia's inflation rate was negative affect at 2001 and 2009. Myanmar's inflation rate was negative affect at 2016. Singapore's inflation rate was negative affect at 2001, 2002, 2003, 2008, 2013, 2014 and 2019. Vietnam's inflation rate was negative affect at 2015, during in this study of period 2000 to 2019 at ASEAN Countries. Because of inflation rate is negative so these countries need to inflation essentially works as a stabilizing tool for the economy, inflation affects all aspects of the economy, consumer spending, business investment and employment rates to government programs, tax policies, and interest rates, understanding inflation is crucial to investing because it can reduce the value of investment returns. Printing more money**,** if there is more money chasing the same amount of goods, then prices will rise. Hyperinflation is usually caused by an extreme increase in the money supply. In a recession, an increase in the money supply may just be saved, e.g. banks

don’t increase lending but just keep more bank reserves. In general, can be interpreted as a constant rising of general prices over a certain period.

2.4 Gross Domestic Products (GDP) per Capita

Gross Domestic Products GDP is the most commonly used measure for the size of an economy. GDP can be compiled for a country, a region (Such as Tuscany in Italy or Burgundy in France), or for several countries combined, as in the case of the European Union (EU). GDP measures the value of all final goods and services produced in a country or region over a particular period of time. A higher rate of economic growth signals the size of the potential market, which could be expended in the future. Economic growth motivates foreign firms to plan new projects or new production facilities. Regions that are experiencing rapid economic growth are also generating more profitable opportunities, and they give the promise of growing markets and growing profit. Growing economies provide growing prospects for profitable investments. The economies of scale and optimum utilization of the resources in the large market is not only beneficial to the investors but also to the growth of the country.

Gross domestic product per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any products taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Date is in constant 2010 US$. The formula of gross domestic product per capita is:

$$\text{Gross domestic product per capita} = \frac{\text{Gross domestic product}}{\text{Midyear population}}$$

Table (2.6) GDP per Capita (PPP) of 2000 to 2019 for ASEAN Countries

(Constant 2017 Internal $)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia
2000	69022.88	1481.66	5689.26	2861.27	15917.06
2001	69483.90	1570.07	5816.43	2977.80	15652.01
2002	70771.60	1642.61	5996.19	3106.01	16155.60
2003	71483.18	1752.04	6198.65	3245.19	16751.41
2004	70616.62	1902.10	6423.72	3399.35	17538.49
2005	69787.82	2120.55	6699.27	3584.32	18114.14
2006	71843.52	2313.34	6974.45	3830.40	18752.55
2007	71051.71	2511.90	7319.43	4052.84	19546.99
2008	68856.16	2640.63	7657.59	4296.48	20103.50
2009	66851.12	2603.58	7906.26	4542.18	19442.99
2010	67753.42	2716.70	8286.73	4850.18	20536.37
2011	69388.81	2862.91	8680.21	5158.84	21289.26
2012	69090.34	3022.60	9080.07	5489.04	22132.22
2013	66715.69	3191.86	9457.02	5841.88	22855.95
2014	64190.82	3364.28	9801.17	6193.34	23906.23
2015	63147.48	3541.38	10149.60	6543.67	24787.82
2016	60867.29	3728.10	10531.11	6896.13	25541.77
2017	60994.53	3928.37	10935.63	7257.81	26661.51
2018	60389.18	4159.34	11371.73	7592.83	27577.38
2019	62098.01	4388.80	11812.10	7886.65	28421.46

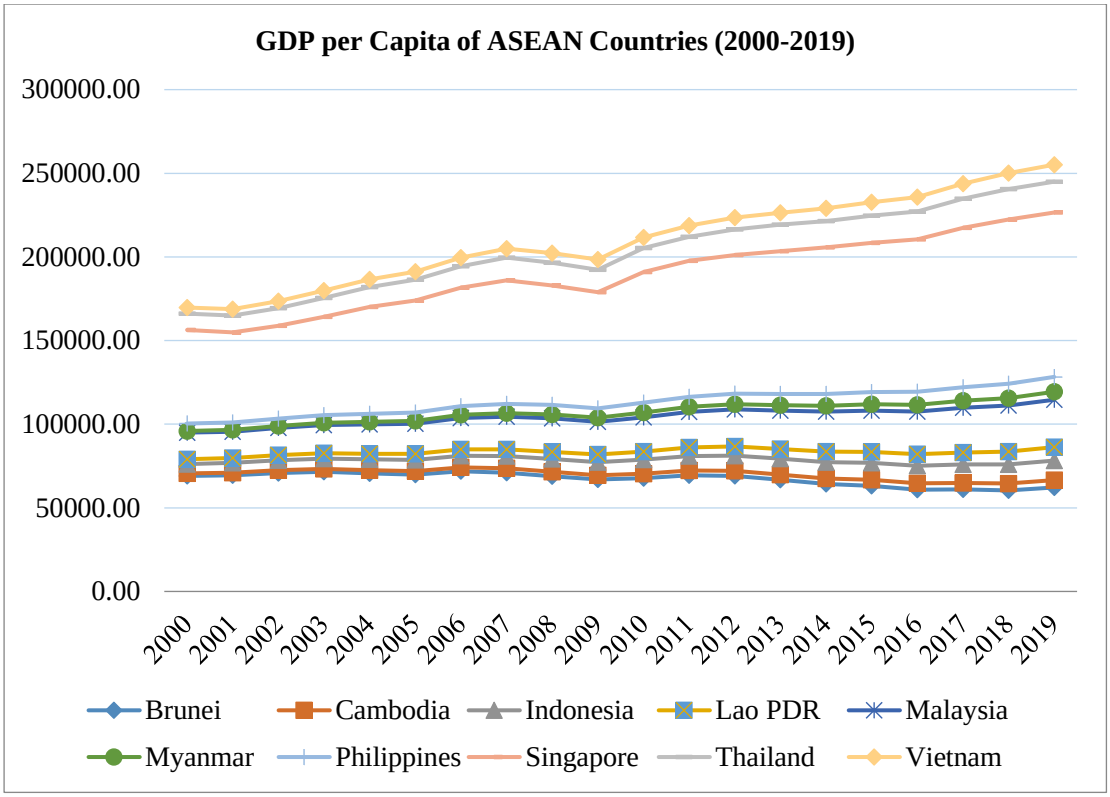
Source: World Development Indictors, World Data Bank

Table (2.7) GDP per Capita (PPP) of 2000 to 2019 for ASEAN Countries

(Constant 2017 Internal $)

Year	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	948.78	4453.76	55904.23	9809.62	3649.24
2001	1055.65	4492.72	53833.73	10053.82	3835.30
2002	1167.40	4562.76	55437.56	10583.76	4038.12
2003	1306.77	4697.49	58819.96	11260.16	4276.47
2004	1473.02	4908.06	63862.12	11886.32	4556.62
2005	1659.69	5054.24	66973.55	12304.40	4855.52
2006	1867.15	5228.32	70756.44	12837.88	5146.15
2007	2086.99	5474.68	73992.12	13460.06	5461.28
2008	2303.80	5618.48	71464.93	13620.53	5715.36
2009	2527.39	5606.59	69430.48	13458.53	5965.16
2010	2762.61	5918.37	78115.21	14399.04	6285.14
2011	2947.66	6043.60	81258.08	14450.48	6620.01
2012	3113.01	6351.26	82805.61	15424.54	6911.74
2013	3330.47	6666.25	85400.73	15767.36	7218.92
2014	3574.03	6973.64	87616.64	15854.13	7601.86
2015	3663.14	7300.14	89160.73	16285.39	8048.70
2016	4020.24	7705.05	91146.10	16782.10	8498.81
2017	4224.55	8120.87	95310.33	17422.95	8996.38
2018	4467.86	8516.14	98336.96	18101.52	9548.70
2019	4739.71	8914.72	98283.31	18438.65	10134.26

Source: World Development Indictors, World Data Bank



Source: Table (2.6) and (2.7)

Figure (2.6) GDP per Capita of ASEAN Countries (2000-2019)

According to the Table (2.7) in ASEAN countries, GDP per capita of Brunei was 69022.88 in 2000 an increase of 1593.74 over the year 2004 GDP per capita of 70616.62, in 2009 of GDP per capita was 66851.12 a decrease of 2660.3 over the year 2014 GDP per capita was 64190.82, a decrease of 2092.81 over the year 2019 GDP per capita was 62098.01.

The GDP per capita of Cambodia was 1481.66 in 2000 an increase of 420.44 over the year 2004 GDP per capita of 1902.10, in 2009 of GDP per capita was 2603.58 an increase of 760.7 over the year 2014 GDP per capita was 3364.28, an increase of 1024.52 over the year 2019 GDP per capita was 4388.80. The GDP per capita of Cambodia was 1481.66 in 2000 an increase of 420.44 over the year 2004 GDP per capita of 1902.10, in 2009 of GDP per capita was 2603.58 an increase of 760.7 over the year 2014 GDP per capita was 3364.28, an increase of 1024.52 over the year 2019 GDP per capita was 4388.80.

The GDP per capita of Indonesia was 5689.26 in 2000 an increase of 734.46 over the year 2004 GDP per capita of 6423.72, in 2009 of GDP per capita was 7906.26 an increase of 1894.91 over the year 2014 GDP per capita was 9801.17, an

increase of 2010.93 over the year 2019 GDP per capita was 11812.10. The GDP per capita of Lao was 2861.27 in 2000 an increase of 538.08 over the year 2004 GDP per capita of 3399.35, in 2009 of GDP per capita was 4542.18 an increase of 1651.16 over the year 2014 GDP per capita was 6193.34, an increase of 1693.31 over the year 2019 GDP per capita was 7886.65.

The GDP per capita of Malaysia was 15917.06 in 2000 an increase of 1621.43 over the year 2004 GDP per capita of 17538.49, in 2009 of GDP per capita was 19442.99 an increase of 4463.24 over the year 2014 GDP per capita was 23906.23, an increase of 4515.23 over the year 2019 GDP per capita was 28421.46. The GDP per capita of Myanmar was 948.78 in 2000, an increase of 524.24 over the year 2004 GDP per Capita was 1473.02, in 2009 GDP per Capita was 2527.39 an increase of 1046.64 over the year 2014 was 3574.03, in increase of 1165.68 over the year 2019 GDP per Capita was 4739.71.

The GDP per capita of Philippines was 4453.76 in 2000, an increase of 454.3 over the year 2004 GDP per Capita was 4908.06, in 2009 GDP per Capita was 5606.59 an increase of 1367.1 over the year 2014 was 6973.64, in increase of 1941.08 over the year 2019 GDP per Capita was 8914.72. The GDP per capita of Singapore was 55904.23 in 2000, an increase of 7957.89 over the year 2004 GDP per Capita was 63862.12, in 2009 GDP per Capita was 69430.48 an increase of 18186.16 over the year 2014 was 87616.64, in increase of 10666.67 over the year 2019 GDP per Capita was 98283.31.

The GDP per capita of to the Thailand was 9809.62 in 2000, an increase of 2076.7 over the year 2004 GDP per Capita was 11886.32, in 2009 GDP per Capita was 13458.53 an increase of 2395.6 over the year 2014 was 15854.13, in increase of 2584.52 over the year 2019 GDP per Capita was 18438.65. The GDP per Capita of Vietnam was 3649.24 in 2000, an increase of 907.38 over the year 2004 GDP per Capita was 4556.62, in 2009 GDP per Capita was 5965.16 an increase of 1636.7 over the year 2014 was 7601.86, in increase of 2532.4 over the year 2019 GDP per Capita was 10134.26.

The result of this research indicates that each country has a not strong and significant correlation between HDI and GDP per capita. It is concluded that the level of HDI can affect the GDP per capita. Economic growth makes it possible to reach a low level of human development, on the one hand, increasing levels of human development leading to increase opportunities for economic growth.

2.4.1 Gross National Income (GNI)

A decent standard of living is measured by gross national income (GNI) per capita. Gross national income (GNI) per capita: Aggregate income of an economy generated by its production and its ownership of factors of production, less the incomes paid for the use of factors of production owned by the rest of the world, converted to international dollars using PPP rates, divided by midyear population. GNI per capita in 2011 purchasing power parity (PPP).

The dimension indices are calculated as:

$$\text{Dimension index} = \frac{\text{Actual value} - \text{minimum value}}{\text{Maximum value} - \text{minimum value}}$$

The HDI is the geometric mean of the three-dimensional indices:

$$HDI = (I_{Health} \cdot I_{Education} \cdot I_{Income})^{1/3}$$

2.5 Unemployment Rate

Unemployment rate is measured in numbers of unemployed people as a percentage of the Labour Force. Unemployed are working age individuals who are not working, are available for work, and have taken Specific Steps to find work. At macro level, unemployment rate is considered as tool to measure general performance of Labour market and the efficiency and effectiveness of an economy to utilize the Labor Force.

The Unemployment rate is the share of the labor force that is jobless, expressed as a percentage. When the economy is in poor shape and jobs are scarce, the Unemployment rate can be expected to rise. When the economy is growing at a healthy rate and be jobs are relatively plentiful, it can be expected to fall. Unemployment is described as the state of not having a job for some people who are able to and want to work out unable to find a job. The economic and social costs caused by the people who do not take part in the production process are quite high. In the economies having higher Unemployment rate, first of all the actual rate of national output falls behind the potential rate of national output since all of the resources can't

be used effectively. Factor for Furthermore, Unemployment constitutes an important risk factor for poverty.

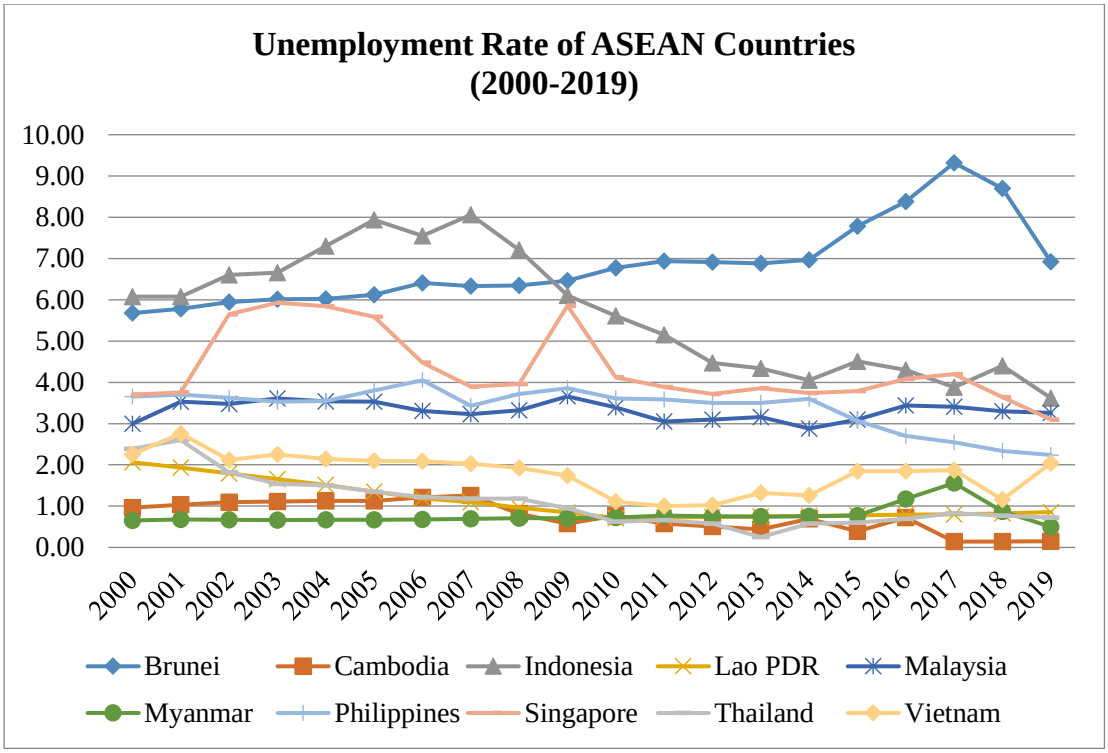
Long-term Unemployment can have serious ramifications for the individual and for the economy. People who are out of work for a long time lose their job skills and become less employable as time goes by. They also lose the motivation to look for work and become dissatisfied and depressed. Long-term Unemployment can also be a burden upon taxpayers and social service systems. There are a few of the negative consequences of a high Unemployment rate on HDI. Unemployment rate of ASEAN countries from 2000 to 2019 are described in APPENDIX_A. Figure (2.5), illustrates the line chart for Unemployment rate of ASEAN countries from 2000 to 2019.

Table (2.8) Unemployment, Total (% of total labor force) of ASEAN Countries (2000- 2019)

Unemployment, total (% of total labor force) (modeled ILO estimate)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	5.68	0.97	6.08	2.06	3.00	0.65	3.65	3.70	2.39	2.26
2001	5.78	1.03	6.08	1.94	3.53	0.67	3.70	3.76	2.60	2.76
2002	5.94	1.10	6.60	1.80	3.48	0.67	3.63	5.65	1.82	2.12
2003	6.01	1.11	6.66	1.66	3.61	0.66	3.53	5.93	1.54	2.25
2004	6.02	1.13	7.30	1.51	3.54	0.67	3.55	5.84	1.51	2.14
2005	6.13	1.13	7.94	1.35	3.53	0.67	3.80	5.59	1.35	2.10
2006	6.41	1.21	7.55	1.19	3.31	0.68	4.05	4.48	1.22	2.09
2007	6.33	1.26	8.06	1.10	3.23	0.69	3.43	3.90	1.18	2.03
2008	6.35	0.82	7.21	0.97	3.32	0.71	3.72	3.96	1.18	1.93
2009	6.47	0.58	6.11	0.85	3.66	0.71	3.86	5.86	0.95	1.74
2010	6.77	0.77	5.61	0.71	3.39	0.72	3.61	4.12	0.62	1.11
2011	6.94	0.58	5.15	0.73	3.05	0.77	3.59	3.89	0.66	1.00
2012	6.92	0.51	4.47	0.74	3.10	0.75	3.50	3.72	0.58	1.03
2013	6.88	0.44	4.34	0.75	3.16	0.75	3.50	3.86	0.25	1.32
2014	6.97	0.69	4.05	0.76	2.88	0.75	3.60	3.74	0.58	1.26
2015	7.78	0.39	4.51	0.78	3.10	0.77	3.07	3.79	0.60	1.85
2016	8.38	0.72	4.30	0.79	3.44	1.18	2.70	4.08	0.69	1.85
2017	9.32	0.14	3.88	0.81	3.41	1.56	2.55	4.20	0.83	1.87
2018	8.70	0.14	4.40	0.83	3.30	0.87	2.34	3.64	0.77	1.16
2019	6.92	0.15	3.62	0.85	3.26	0.50	2.24	3.10	0.72	2.04

Source: World Development Indicators, World Data Bank



Source: Table (2.8)

Figure (2.7) Unemployment Rate of ASEAN Countries (2000-2019)

According to the Table (2.8) At 2016 Brunei's unemployment rate was 8.38% in increase 0.94% over the year 2017, in 2018 unemployment rate was 8.7% a decrease 1.78% over the year 2019 unemployment rate was 6.92%. So, Brunei country's HDI increase in 2019.

The unemployment rate of Cambodia in 2000 was 0.97% an increase of 0.29% over the year 2007 unemployment rate of 1.26%, in 2008 was 0.58% a decrease of 0.68% over the year 2007 unemployment rate and in 2013 unemployment rate was 0.44% an increase 0.25% over the year 2014 unemployment rate was 0.69%. In 2016 unemployment rate was 0.72% a decrease 0.58% over the year 2018 unemployment rate was 0.14%, an increase 0.01% over the year 2019 unemployment rate was 0.15%.

The unemployment rate of Indonesia were 6.08% in 2000, 2001 an increase of 1.98% over the year 2007 unemployment rate of 8.06%, in 2014 of unemployment rate was 4.05% an increase of 0.46% over the year 2015 unemployment rate 4.51%, in 2016 of unemployment rate was 4.30% a decrease of 0.68 % over the year 2019 unemployment rate was 3.62%. So, Indonesia country's HDI increase in 2019.

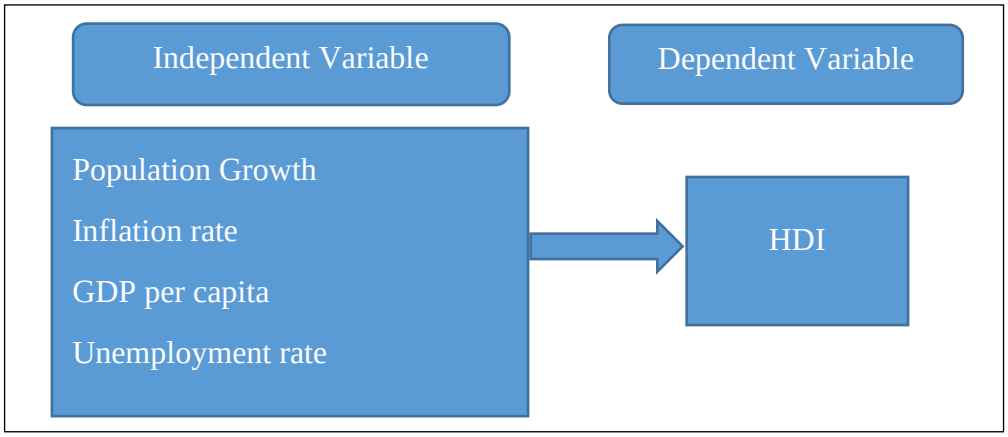
The unemployment rate of Lao PDR was 2.06% in 2000 an increase of 1.35% over the year 2010 unemployment rate of 0.71%, in 2011 of unemployment rate was 0.73% an increase of 0.12% over the year 2019 unemployment rate was 0.85% but a decrease of 0.21% over the year 2000 unemployment rate was 2.06%. The unemployment rate of Malaysia were 3% in 2000 an increase of 0.39% over the year 2010 unemployment rate of 3.39%, in 2015 of unemployment rate was 3.10% an increase of 0.34% over the year 2016 unemployment rate 3.44%, a decrease of 0.18 % over the year 2019 unemployment rate was 3.26%.

The unemployment rate of Myanmar was 0.65% in 2000 an increase of 0.12% over the year 2015 unemployment rate of 0.77%, in 2018 of unemployment rate was 0.87% a decrease of 0.12% over the year 2019 unemployment rate was 0.5% but a decrease of 0.37% over the year 2000 unemployment rate was 2.06%. The unemployment rate of Philippines was 3.65% in 2000 an increase of 0.4% over the year 2006 unemployment rate of 4.05%, in 2016 of unemployment rate was 2.70% a decrease of 1.35% over the year 2006 unemployment rate, in 2016 of unemployment rate was 2.70% a decrease of 0.46% over the year 2019 unemployment rate was 2.24%.

The unemployment rate of Thailand was 2.39% in 2000 an increase of 0.21% over the year 2001 unemployment rate of 2.60%, in 2008 of unemployment rate was 1.18% a decrease of 0.23% over the year 2009 unemployment rate was 0.95%, in 2010 of unemployment rate was 0.62% a decrease of 0.33% over the year 2009 unemployment rate, in 2012 of unemployment rate was 0.58% a decrease of 0.33% over the year 2013 unemployment rate was 0.25%, in 2019 of unemployment rate was 0.72% a decrease of 0.47% over the year 2013 unemployment rate was 0.25%.

The unemployment rate of Vietnam was 2.26% in 2000 an increase of 0.4% over the year 2001 unemployment rate of 2.76%, in 2003 of unemployment rate was 2.25% a decrease of 1.25% over the year 2011 unemployment rate was 1%, in 2014 of unemployment rate was 1.26% a decrease of 0.1% over the year 2018 unemployment rate was 1.16%, an increase of 0.88% over the year 2019 unemployment rate was 2.04%.

In addition to low quality of human resources, unemployment is also another contributing factor to poverty. Serval stylized facts have dominated the discussion on the changing nature of work. However, only some of them are accurate in the context of emerging economics.



Source: Own Compilation

Figure (2.8) Conceptual Framework

CHAPTER III
PANAL DATA REGRESSION MODELS

This study is undertaken based on panel data of ASEAN countries. The effects of Human Development Index (HDI) is calculated by using the panel data regression models (fixed effect model, random effect model) have been used to examine the effects of four explanatory variables (population, inflation rate, GDP growth rate and unemployment rate) on HDI.

3.1 Panel Data

Panel data are also called longitudinal data or cross-sectional time-series data. These longitudinal data have "observations on the same units in serval different time periods" (Kennedy, 2008). A panel data set has multiple entities and each of which has repeated measurements at different periods. Panel data may have individual (group) effect, time effect, or both, which are analyzed by fixed effect or random effect models. Baltagi (2001) point out. "Panel data give more information data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency". Given well-organized panel data, panel data models are definitely attractive and appealing since they provide ways of dealing with heterogeneity v examine fixed or random effects in the longitudinal data. A panel data set contains N cross section units that are collected at different time periods (T). Therefore, the total number of observations is nT. Panel data are measured at regular intervals (e.g., year, quarter and month). A panel may be long or short, balanced or unbalanced, and fixed or rotating.

3.2 Advantages of Panel Data

The following are the advantage models, panel data by Baltagi (2001);

(i) Contrary to time series and cross-section models, panel data suggest that countries, firms, products are heterogeneous and it controls heterogeneity so as not to take the risk of biased results. Time-series study or cross-section

analyses are not able to control individual invariant and time invariant variables.

(ii) Since panel data use both cross-section and time series, panel data give more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency.

(iii) Compared to time series and cross-section models, panel data can detect and measure errors better.

(iv) Panel data is much better and efficient for studying with more complicated behavioral models.

3.3 Panel Data Regression Models

The regression models based on the panel data are called panel data regression models. Panel data models investigate group (individual-specific) effects, time effects, or both. These effects are either fixed effect or random effect. A fixed effect model investigates if intercepts vary across groups or time periods, whereas a random effect model explores differences in error variances.

3.3.1 The Ordinary Least Square Regression Model

A panel data model approach is most simply because it combines only time series and cross section data. In this model is not considered time and individual dimensions, so it is assumed that the behavior of corporate data is the same in various periods. This method can use the ordinary least square to estimate the panel data model. The ordinary least square model can be written as:

$$\mathbf{y_{it}} = \alpha_i + \beta X_{it} + u_{it} \quad (3.1)$$

Where, y_{it} = the dependent variable observed for individual I at time t.

X_{it} = the time-variant 1 x k (the number of independent variables) regressor Vector

β = k x 1 matrix of parameters

α_i = constant

u_{it} = the error term

i = 1,2,…..,N

t = 1,2,…….T

i is the i^{th} subject and t is the time period for the variables

3.3.2 Fixed Effect (within) Model

$$\mathbf{y}_{it} = \beta_{1i} + \beta_2 X_{1it} + \beta_3 X_{2it} + \beta_4 X_{3it} + \beta_5 X_{4it} + u_{it} \quad (3.2)$$

where, $\mathbf{y}_{it}$ = the dependent variable observed for individual I at time t.

X_{it} = the time-variant 1 x k (the number of independent variables) regressor vector

β = k x 1 matrix of parameters

u_{it} = the error term

I = 1,2,……,n

T = 1,2,……,T

i is the i^{th} subject and

t is the time period for the Variables

Equation (3.2) is known as the fixed effects (regression) model (FEM). The team "Fixed effects" is due to the fact that, although the intercept may differ across subjects, each entity's intercept does not vary over time, that is, it is time-invariant. The fixed effect model examines differences in intercepts, assuming the same Slopes and Constant Variance across entities or subjects since a group (individual specific) effect is time invariant and considered a part of the intercepts, u_i is allowed to be correlated to other regressions.

One way to estimate a pooled regression is the fixed effect within group estimator. It is to eliminate the fixed effect, B 1i , by expression the sample mean values of each variables and subtract them the individual values of the variables. The resulting values are called 'de-meaned' or mean Corrected Values.

A within group effect model does not need dummy variables, but it uses divinations from group mean. Thus, the model is the OLS of $(Y_{it} - \bar{Y}_i) = (X_{1it} - X_{it})\beta_2 + (X_{1it} - X_{it})\beta_3 + (X_{1it} - X_{it})\beta_4 + (u_{it} - \tilde{U}_i)$ without an intercept. The incidental parameter problem is no longer an issue. The parameter estimates of repressors' in the within effect model are identical to those of ASEAN Countries. The within effect model in turn has several disadvantages.

Since this model does not report dummy Coefficients, it needs to compute them using the formula...

$\beta_{1i} = \bar{Y}_i - \bar{X}_{1i}\,\beta_2 - X_{2i}\,\beta_3 - X_{3i}\,\beta_4 - X_{4i}\,\beta_5$

$\bar{Y}_i$ = dependent variable mean of group i.

$\bar{x}_i$ = mean of independent variable (IVs) of group i.

3.3.3 Random Effect Model

Even the fixed effect model is not difficult to apply but it is not appropriate for estimation if data have high degrees of freedom or a large number of cross-section data. The random effects of both cross-section and time series. Time series data are included with error term. This model is called error component model (ECM). The assumption is that there are other factors which might affect dependent variable in the regression analysis but are omitted from the investigation causing what is called random error term. This model will estimate panel data where interference variables may be interconnected between time and between individuals. The advantage of using the Random Effect model is to eliminate heteroscedasticity. This model is also called the Error Component Model (ECM) or Generalized Least Square (GLS) technique.

In the random effect model, residuals may be interconnected between time and between individuals or cross sections. Therefore, this model assumes that there is a difference of intercept for each individual and the intercept is a random variable. So in the random effect model there are two residual components. The first is the residual as a whole where the residual is a combination of cross-section and time series, the second residual is an individual residual which is a random characteristic of the i^{th} unit observation and remains at all times. Then, the random effects model can be written as:

$$\mathbf{y_{it}} = \boldsymbol{\alpha_i} + \beta X_{it} + u_i + \varepsilon_{it} \qquad (3.3)$$

Where, y_{it} = the dependent variable observed for individual I at time t.

X_{it} = the time-variant 1x k (the number of independent variables) regressor vector

β = k x 1 matrix of parameters

α_i = constant

ε_{it} = the residual as a whole where the residual is a combination of cross section and time series.

u_i = the individual residual which is the random characteristic of unit observation the i-th and remains at all times.

i = 1,2,…..,N

t = 1,2,…..,T

i is the i^{th} subject and

t is the time period for the variables

3.3.4 Fixed Effects Versus Random Effects Model

1. If T (the number of time series data) is large and n (the number of cross-section units) is small, there is likely to be little difference in the value of the parameters estimated by FEM and ECM. Hence, the choice here is based on computational convenience. On the score, FEM may be preferable.
2. When n is large and T is small, the estimates obtained by the two methods can differ significantly. In ECM $\beta_{1i} = \beta_1 + \varepsilon_i$ where ε_i is the cross-sectional random component whereas in FEM, β_{1i} treats as fixed and not random. In that case, FEM is appropriate, if the cross-section units in the sample are regarded as random drawing, then ECM is appropriate.
3. If the individual error component ε_i and one or more regressors are correlated, then ECM estimators are biased, whereas those obtained from FEM are unbiased.
4. If n is large and T is small, and if the assumptions underlying ECM hold, ECM estimators are more efficient than FEM.
5. Unlike FEM, ECM can estimate coefficients of time-invariant variables. The FEM does control for such time-invariant variables, but it cannot estimate them directly, as is clear from the LSDV or within-group estimator models. If it is assumed that ε_i and X's are correlated, FEM may be appropriate. In FEM, each cross-sectional unit has its own (fixed) intercept and represents the mean value of all the (cross-sectional) intercepts and the error component ε_i represents the (random) deviation of individual intercept for this mean value.

3.4 Testing for Appropriate Model

Breusch- Pagan Lagrange Multiplier test, F- test and Hausman test were used to choose the appropriate model for population, inflation rate, gross domestic product per capita and unemployment rate.

3.4.1 Breusch and Pagan Lagrange Multiplier Test (LM)

The Breush and Pagan Lagrange Multiplier Test carried out on the estimates of the random model showed that the random effect model was appropriate for the data. The null hypothesis of the random effect model is that individual-specific or time-series error variances are zero ($\sigma_u^2 = 0$).

Test hypothesis is:

Null Hypothesis : The random effect model is not appropriate.

Alternative Hypothesis : The random effect model is appropriate.

3.4.2 F- Test

In order to check the significance between ordinary least squares model and fixed effect model, F statistics is used. F-test is a statistical test that is used to determine whether two population having normal distribution have the same variance or standard deviation. F test has null hypothesis that is OLS model and the alternative hypothesis is fixed effect model.

$$F_{1\text{-way}} = \frac{(ESS_R - ESS_U / (N-1)}{ESS_U / ((T-1)\ N-k)}$$

where,

ESS_R = the residual sum of squares under the null hypothesis

ESS_U = the residual sum of squares the alternative hypothesis

Under the null hypothesis the statistics $F_{1\text{-way}}$ is distributed as F with (N-1, (T-1) N.K) degree of freedom. The two sums of squares evolve as intermediate results from OLS and from fixed effect estimation.

3.4.3 Hausman Test

The Hausman specification test compares the fixed and random effects under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model [Hausman (1978)]. If H_0 is rejected, a random effect model produces biased estimates, violating one of the Gauss-Markow assumption; so a fixed effect model is preferred. Hasusman's essential result is that the covariance of an efficient estimator with difference from an efficient estimator is zero [Greene (2003)]. Hausman test is a good way to choose which model is better for the researches. The test statistics developed by Hausman test has an asymptotic Chi-square distribution.

Test hypothesis is:

Null Hypothesis : The random effect model is appropriate.

Alternative Hypothesis : The fixed effect model is appropriate.

3.5 Diagnostic Checking

Breusch-Pagan-Godfrey test and Wooldridge test were used to diagnostic heteroskedastic and serial correlation in the model.

3.5.1 Breusch-Pagan-Godfrey test

Breusch-Pagan-Godfrey test (sometimes shorted to the Breusch-Pagan test) is a test for heteroscedasticity of errors in regression. Homoscedasticity in regression is an important assumption; if the assumption is violated, it won't be able to use regression analysis. If the test statistic has a p-value below an appropriate threshold (e.g. $p<0.05$), then, the null hypothesis of homoscedasticity is rejected and heteroscedasticity is assumed.

Test hypothesis is:

Null Hypothesis : The error variance is homoscedasticity.

Alternative Hypothesis : The error variance is heteroscedasticity.

3.5.2 Wooldridge Test

Serial correlation in random or fixed effects models derived by Wooldridge (2002) is attractive because it can be applied under general conditions and is easy to be implemented. Serial correlation occurs in time-series studies when the errors associated with a given time period are carried over into future time periods. If the test statistic has a p-value ‹ 0.05, then, the null hypothesis is rejected.

Test hypothesis is:

Null Hypothesis : There is no serial correlation.

Alternative Hypothesis : There is serial correlation.

3.5.3 Auto-Correlation

If linear panel-data models show auto-correlation, the standard errors from these model's biases and cause the results to be less efficient. In order to test auto-correlation. Wooldridge's method is used in the model. Wooldridge's methods use the residuals from a regression in first-differences. The first differencing data removes the individual level effect, the term based on the time-invariant covariates and the constant,

$$y_{it} - y_{it-1} = (\chi_{it} - \chi_{it-1}) b_1 + \varepsilon_i - \varepsilon_{it} - \varepsilon_{it-1} \quad (3.5.3)$$

3.5.4 Feasible Generalized Least Squares Estimator

Park (1967) proposed a feasible generalized least-squares (FGLS) for the data with heteroscedasticity as well as for temporal and spatial dependence in the residual of time-series cross-section models. FGLS produce an efficient estimation for the case where the number of T (time period) is greater than or equal to the number of N (cross-section).

The FGLS estimation method takes into account heteroscedasticity and auto-correlation. The error terms can be explained as

$$\mathbf{E}[\mathbf{EE}'] = \Omega = \begin{bmatrix} \sigma_{11}\,\Omega_{11} & \sigma_{12}\,\Omega_{12} & \ldots. & \sigma_{1N}\,\Omega_{1N} \\ \sigma_{11}\,\Omega_{11} & \sigma_{12}\,\Omega_{12} & \ldots. & \sigma_{1N}\,\Omega_{1N} \\ . & . & & . \\ . & . & & . \\ \sigma_{N1}\,\Omega_{N1} & \sigma_{N2}\,\Omega_{N2} & \ldots. & \sigma_{NN}\,\Omega_{NN} \end{bmatrix}$$

where

$$\Omega_{ij} = \begin{bmatrix} 1 & P_j & P_j^2 & \ldots\ldots\ldots & P_j^{T-1} \\ P_i & 1 & P_j & \ldots\ldots\ldots & P_j^{T-2} \\ P_j^2 & P_j & 1 & \ldots\ldots\ldots & P_j^{T-3} \\ \ldots. & \ldots.. & \ldots. & \ldots\ldots.. & \\ P_j^{T-1} & P_j^{T-2} & P_j^{T-3} & \ldots\ldots\ldots & 1 \end{bmatrix}$$

As FGLS panel data model is also known as the Parks-Kmenta method (Kmenta 1986). In FGLS model, the regression is estimated by using regular OLS. In order to estimate assumed error AR (1) serial correlation p, the estimation residual is utilized. This coefficient is used to transform the model to eliminate error serial correlation. Substitute Ω for Ω using estimated p and σ^2, then obtain the FGLS estimator of β as

$$\hat{\beta}_{GLS} = (\mathbf{x}'^{\Omega}\, x)^{-2}\, \mathbf{x}'\Omega^{-1} y.$$

CHAPTER IV
APPLICATION OF PANEL DATA REGRESSION MODELS FOR ANALYSING HUMAN DEVELOPMENT INDEX OF ASEAN COUNTRIES

In this chapter, the effects of Human Development Index (HDI) are firstly studied by using pooled ordinary least square regression analysis. The model consists of one explained variable and four explanatory variables. The explained variable is human development index and the four explanatory variables are population growth, inflation rate, Gross Domestic Product (GDP) per capita, unemployment rate and the data is a panel data. Then, the panel data regression models (fixed effect model, random effect model) have been used to examine the effects of four explanatory variables (population growth, inflation rate, Gross Domestic Product (GDP) per capita, unemployment rate) on HDI. Hausman test has been also used in this study to choose the appropriate model between the fixed effect model and the random effect model. The panel data which consist of ASEAN Countries for the period from 2000 to 2019 time series has been used in this study. The data are shown in APPENDIX-A.

4.1 Pooled Ordinary Least Square Regression Analysis

The equation of the pooled OLS regression model can be expressed as

$$HDI_{it} = \beta_1 + \beta_2 Popgrowth_{it} + \beta_3 Inf_{it} + \beta_4 GDP_{it} + \beta_5 UR_{it} + u_{it}$$

where, $i = 1,2,\ldots..,10$

$t = 1,2,\ldots..,20$

β_1 = Intercept

HDI = Human Development Index

β_2 = Slope of Population growth

Pop growth = Population growth

β_3 = Slope of inflation rate

Inf = Inflation rate

β_4 = Slope of GDP per capita

GDP = GDP per capita

β_5 = Slope of unemployment rate

UR = Unemployment rate

By using the time series data of HDI, Population growth, Inflation rate, Gross Domestic Product (GDP) per capita and unemployment rate during the period of 2000 to 2019, the first estimating result of multiple regression model are shown in the following Table (4.1).

Table (4.1) Summary Results for Pooled OLD Regression Model of HDI

Variables	Coefficient	Std error	t-Statistics	Sig	VIF
Constant	.6211565	.0121724	51.03	0.000***	1.33
Population growth	-.0077373	.0072292	-1.07	0.286**	1.63
Inflation rate	-.0023202	.0006829	-3.40	0.000***	1.57
GDP per capita	3.05e-06	2.18e-07	14.01	0.000***	1.07
Unemployment rate	.0150128	.0025987	5.78	0.000***	1.06
R-squared		0.7409	Durbin- Watson		0.407
Adjusted R-squared		0.7356	F- Statistics		139.39
St. Error of the Estimate		0.06408	p-value		0.0000

Source: STATA output

***, **, * statistically significant at 1% level, 5% level and 10% level.

From the estimation results for HDI, it is found that inflation rate, GDP per capita and unemployment rate are statistically significant at 1% level. It means that the inflation rate, GDP per capita and unemployment rate variable effect on human development index. Population growth is not statistically significant. The adjusted R^2 in this study shows 0.7356; it means that the variation in HDI can be explained by 73.56%.

The estimated Pooled OLS model for HDI, Population growth, Inflation rate, Gross Domestic Product (GDP) per capita and unemployment rate in ASEAN countries can be expressed as follow:

HDI_{it} = .6211565 – .0077373$Popgrowth_{it}$ -.0023202β_3 Inf_{it} + .00000305 GDP_{it} + .0150128 UR_{it} + u_{it}

From the above equation, it is found that inflation rate have negative effect on HDI. If inflation rate increase by1%. HDI will decrease by 0.00232%. Therefore, it can be concluded that inflation rate increase, HDI will be decreased.

GDP per capital have positive effect on HDI. If GDP per capita increase 1% , HDI will increase 0.00000305%. Therefore, it can conclude that GDP per capital increase, HDI will be increased. If unemployment rate increase by 1%, HDI will increase 0.0150128%. It can be found that although unemployment rate increase, HDI will not be decreased.

In addition, it is needed to be check the multicollinearity and autocorrelation. According to the figure shown in Appendix Table (A1), Durbin-Watson 0.407 is indicating the autocorrelation. Variance Inflation Factor (VIF) is the measure of multicollinearity. The VIF values of variable; 1.33, 1.63, 1.57, 1.07, and 1.06.The total VIF value is less than 10 and it can be said that there is no multicollinearity.

4.2 The Fixed Effect Model for HDI and Some Indicators of ASEAN Countries

The explained variable HDI and the four explanatory variables (population, inflation rate, GDP per capita and unemployment rate) are analyzed by using the fixed effect model. A fixed effect model examines differences in intercepts, assuming the same slopes and constant variance across countries. Since individual specific effect is time invariant and considered a part of the intercept, u_i is allowed to be correlated to other regressors.

The fixed effect model for HDI and some indicators (Population, Inflation rate, GDP per capita, unemployment rate) is as follows:

$$HDI_{it} = \beta_{1i} + \beta_2 Popgrowth_{it} + \beta_3 Inf_{it} + \beta_4 GDP_{it} + \beta_5 UR_{it} + u_{it}$$

where, $i = 1,2,\ldots..,10$

$T = 1,2,\ldots..,20$

β_1 = Intercept

HDI = Human Development Index

β_2 = Slope of Population growth

Pop growth = Population growth

β_3 = Slope of inflation rate

Inf = Inflation rate

β_4 = Slope of GDP per capita

GDP = GDP per capita

β_5 = Slope of unemployment rate

UR = Unemployment rate

The following Table (4.2) presents the fixed effect model for some indicators and HDI in ASEAN countries.

Table (4.2) Summary Results for Fixed Effect Model of HDI

Variables	Coefficient	St. Error	t	P-value
Constant	.6560894	0.0222752	29.45	0.000***
Population growth	-.0008754	.005027	-0.17	0.862
inflation rate	-.0003816	.0003912	-0.98	0.331
GDP per capita	1.84e-06	5.50e-07	3.35	0.001*
unemployment rate	.0050038	.0038304	1.31	0.193
Sigma u	0.07901851			
Sigma e	0.03352742			
Rho	0.84743673			
F(4,186)	3.38			
P-value	0.0107			
No: of groups	10			
No: of time (year)	20			
No: of observations	200			

Source: STATA output

***, **, * statistically significant at 1% level, 5% level and 10% level.

According to the result, in the fixed effect model capita is statistically significant at 5% level, population growth, inflation rate and unemployment rate are not significant.

The estimated fixed effect (within) regression model for HDI and some economic indicators of ASEAN Countries can be expressed as follow:

$$HDI_{it} = .6560894 - .0008754Popgrowth_{it} - .0003816Inf_{it} + 1.84e\text{-}06GDP_{it} + .0050038Un_{it} \quad (4.1)$$

From the above equation, it is found that GDP per capita have positive effect on HDI.

If GDP per capita rises by 1%, HDI will rise by 0.0000084%. Therefore, it can be concluded that GDP increase, HDI will be increased.

4.3 The Random Effect Model for HDI and Some Indicators of ASEAN Countries

The explained variable HDI and the explanatory variables (population growth, Inflation rate, GDP per capita, unemployment rate) is analyzed by using the random effect model. The random effect model estimates variances components for groups for (times) and error, assuming the same intercept and slope, u_i is a part of errors and thus should not be correlated to any regressor.

The random effect model for HDI and some indicators (population growth, Inflation rate, GDP per capita, unemployment rate) is as follows:

$$HDI_{it} = \beta_1 + \beta_2 Pop_{it} + \beta_3 Inf_{it} + \beta_4 GDP_{it} + \beta_5 UR_{it} + \dot{u}_{it}$$

where, I = 1,2,…..,10

t = 1,2,…..,20

β_1 = Intercept

HDI = HDI inflow

β_2 = Slope of Population growth

Pop growth = Population growth

β_3 = Slope of Inflation rate

Inf = Inflation rate

β_4 = Slope of GDP per capita

GDP = GDP per capita

β_5 = Slope of unemployment rate

UR = Unemployment rate

The following Table (4.2) presents the random effect for some indicators and HDI in ASEAN Countries.

Table (4.3) Summary Results for Random Effect Model of HDI

Variables	Coefficient	St. Error	t	P-value
Constant	.6266017	.024192	25.90	0.000***
Population growth	.0011128	.0049327	0.23	0.822
Inflation rate	-.0004648	.0003946	-1.18	0.239
GDP per capita	2.57e-06	4.07e-07	6.33	0.000***
Unemployment rate	0.0090811	.0032474	2.80	0.005**
Sigma u	0.05511784			
Sigma e	0.03352742			
Rho	0.72992054			
P-value	0.0000***			
No: of groups	10			
No: of time (year)	20			
No: of observations	200			

Source: STATA output

***, **, statistically significant at 1% level and 5% level.

According to the result in the random effect model two variables are statistically significant. GDP per capita and Unemployment rate are statistically significant at 1 % level, given the fact that the probability values (p-value 0.0000) is smaller than the critical value, 0.01. The inflation rate is not statistically significant.

The estimated random effect GLS regression model for HDI and some economic indicators of ASEAN Countries can be expressed as follow:

$$HDI_{it} = .6266017 + .0011128\ Popgrowth_{it} - .0004648 Inf_{it} + 2.57e\text{-}06 GDP_{it} + 0.0090811 UR_{it} \quad (4.2)$$

From the above equation, it is found that GDP per capita and unemployment rate have positive effects on HDI.

If GDP per capita rises by 1 %, HDI will be increased by 0.00000257%. Therefore, it can be concluded that if GDP per capita increase, HDI will be increased. It is found that if unemployment rate rises by 1%, HDI will be increased. It is found that if unemployment rate rises by 1%, HDI will increase by 0.0090811%. Therefore, it can be concluded that although unemployment rate increases, HDI will not be decreased. The overall model is also statistically significant at 1% level.

4.4 Hausman Test

The Hausman test is used to determine which model is appropriate fixed effect model or random effect model.

Test Hypothesis is:

Null Hypothesis : The random effect model is appropriate.

Alternative Hypothesis : The fixed effect model is appropriate.

Table (4.4) presents the results of Hausman Test.

Table (4.4) Estimate Results of Hausman Test

Variable	Coefficients		(b-B) Difference	Standard Error
	(b) Fixed effect Model	(B) Random effect Model		
Population growth	0.0011128	0.0011128	0.0000	0
Inflation rate	-.0004648	-.0004648	0.0000	0
GDP per capita	2.57e-06	2.57e-06	0.0000	0
Unemployment rate	.0090811	.0090811	0.0000	0
χ^2 Chi-Square	11.35			
P- Value	0.0229			

Source: STATA Output

***, **, statistically significant at 1% level and 5% level

According to the results of the Hausman test, there is not significant at 10 % level because p-value 0.0229 is greater than 1% level. It means that the null hypothesis is not rejected. Therefore, it can be concluded that the fixed effect model is not appropriate for this study.

4.5 Breusch and Pagan Lagrange Multiplier Test (LM)

The Breusch and Pagan Lagrange Multiplier Test is used to conclude the random effect model was appropriate for data.

Test hypothesis is:

Null Hypothesis : The random effect model is not appropriate.

Alternative Hypothesis : The random effect model is appropriate.

Table (4.5) Breusch and Pagan Lagrange Multiplier Test

Chi-Square (χ^2)	df	P-value
852.30	4	0.0000***

Source: STATA Output

***, **, statistically significant at 1% level and 5% level

As a result, the value of chi square is 852.30 and the p-value 0.0000 is less than 1 % level. It means that the null hypothesis is rejected. Therefore, it can be concluded that there is random individual difference among ASEAN Countries and that the random effect model is appropriate.

4.6 Breusch – Pagon Cook-Weissberg Test for Heteroscedasticity

The Breusch – Pagon Cook-Weissberg test is used to conclude that there is heteroscedasticity in explanatory variables.

Test hypothesis is:

Null Hypothesis : The error variance is homoscedasticity.

Alternative Hypothesis : The error variance is heteroscedasticity.

Table (4.6) Breusch – Pagon Cook-Weissberg Test

Chi-Square (χ^2)	df	P-value
11.35	4	0.0229

Source: STATA Output

***, **, statistically significant at 1% level and 5% level

According to the result, the value of chi square is 11.35 and the p-value 0.0229 is less than 1% level. It means that the null hypothesis is not rejected. Therefore, heteroscedasticity does not exist in the selected data.

4.7 Serial Correlation

Test hypothesis is:

Null Hypothesis : There is no serial correlation.

Alternative Hypothesis : There is serial correlation.

According to the result, the value of chi square is 571.84 and p-value 0.0000 is less than 1 percent. It means that the null hypothesis is rejected.

Therefore, it can be concluded that there is homoscedasticity in population growth, inflation rate, gross domestic product (GDP) per capita and unemployment rate of ten ASEAN Countries this study.

4.8 Feasible Generalized Least Squares Estimator

Breusch Godfrey LM test

Park (1967) proposed a feasible generalized least-squares (FGLS) for the data with heteroscedasticity as well as for temporal and spatial dependence in the residual of time-series cross-section models. FGLS produce an efficient estimation for the case where the number of T (time period) is greater than or equal to the number of N (cross-section).

Table (4.7) Cross-sectional Time-series FGLS Regression

Variables	Coefficient	St. Error	t	P-value
Constant	0.6211565	0.0120193	51.68	0.000***
Population growth	-.0077373	0.0071382	-1.08	0.278
Inflation rate	-.0023202	.0006744	-3.44	0.001**
GDP per capita	3.05e-06	2.15e-07	14.19	0.000***
Unemployment rate	.0150128	0.0025661	5.85	0.000***
Chi-Square (χ^2)	571.84			
P-value	0.0000***			
No: of groups	10			
No: of time (year)	20			
No: of observations	200			

Source: STATA Output

***, **, statistically significant at 1% level and 5% level.

From the table (4.7) shows that, GDP per capita and unemployment rate have positive effects on HDI. It is found that inflation rate have negative effect on HDI. If inflation rate increase by1%, HDI will decrease by 0.0023202%. Therefore, it can be concluded that inflation rate increase, HDI will be decreased.

GDP per capital have positive effect on HDI. If GDP per capita increase 1% , HDI will increase 0.00000305%. Therefore, it can conclude that GDP per capital increase, HDI will be increased. If unemployment rate increase by 1%, HDI will increase 0.0150128%. It can be found that although unemployment rate increase, HDI will not be decreased.

CHAPTER V
CONCLUSION

The result of processing with fixed effect model shows that partially population and per capita of gross domestic product influence the high of human development index in ASEAN member countries. Also, the F test scores indicate that simultaneously all independent variables (population, inflation rate, GDP per capita and unemployment rate) affect the human development index. Several policy recommendations can apply to policymakers regarding the human development index.

5.1 Findings

In this study the panel data regression models such as pooled OLS, fixed effect model, random effect model, hausman test, breusch and pagan lagrangian multiplier test (LM) and breusch - pagan cook-weissberg test are used to analyze the panel data. The panel data which consists of ten ASEAN countries for the period 2000 to 2019 are used to find the impact of four variables (population growth, inflation rate, GDP per capita, unemployment rate) on human development index (HDI).

In this study the panel data regression models such as the pooled OLS, it has been found that inflation rate, GDP per capital and unemployment rate had an impact on the human development index in ASEAN. The population growth had adverse effect, and it means that the higher people it will reduce the quality of human development in the selected countries. This result explains why Singapore and Brunei are in the most top countries because these two countries have a population lower than other ASEAN countries. These finding indicate that the importance of population control program. The GDP per capital also effected human development index. This result indicated that there is positive relationship between the human development index and GDP per capital. It means that the higher economic growth of the country had the higher of human development index. It states that higher per capital income growth rates will have higher the human development index. The other variables rate and inflation rate had an effect on human development index in ASEAN countries.

The unemployment rate doesn't have a direct relationship with the human development index. Therefore, the government must too have a need to decrease the unemployment rate. The inflation rate doesn't have a direct relationship with the human development index, although the inflation will reduce the purchasing power of the people. The determinant of coefficient in this study shows 0.7409. This means that the variables can explain the model approximately 74.09 %.

Hausman test results, which aim to compare the fixed effect model with the random effect model. Hausman test results show does not significant result. The result indicates that the fixed effect model is not appropriate for this study.

The Breusch and Pagan Lagrange Multiplier Test is used to conclude that the random effect model was appropriate for these data. This result shows that there is random individual difference among ASEAN countries and that the random effect model is appropriate. The Breusch-Pagan-Godfrey test is used to conclude that there is heteroscedastiticy in explanatory variables.

Later, the Hausman test is used to choose the appropriate model (fixed effect model or random effect model). The study results, confirm that random effect is more appropriate than fixed effect model. Population growth, Inflation rate, GDP per capita, Unemployment rate have random effect on human development index (HDI).

5.2 Recommendations

The following are the policy implications of this study, can apply to policymakers regarding the human development index. First, the need for population control, as the more significant the population the government should increase its budget to enhance the education and health sectors. Second, the need for policies to accelerate the economy to grow faster. High economic growth will improve the quality of human life in ASEAN member countries. The increase of gross domestic product par capital should continue to be pursued, especially countries that entered the category of low development to the high development. The declining trend of inflation must be kept under surveillance because of the economic consequences of its own. This decline illustrates the declining purchasing power or is it the success of the government policy to control inflation or is the effect of the global economy still depressed. Therefore, the government should pay more attention and more allocation.

The success in birth control should be continued considering the need of labor in long term. This policy should also be in line with the policy to alleviate poverty and improve the community welfare.

It may be noted that data science and statistics are indistinguishable and closely linked. Though statistics is a discipline with a well-established methodology in data collection, analysis and forecasting, it is clear that statistics is used as a major tool or method for data science. Data science is a wide domain where statistical method is an essential component. Data science and statistics will continue to exist and there is a big overlap between these two disciplines. Some data statisticians are now making efforts to broaden the learning scope of statistics in the form of data science and prioritize extracting from data applicable predictive tools over explanatory theories, leading to an increasing applied field that grows out of traditional statistics and beyond.

5.3 Further Study

In this study, the availability of variables is challenging since it is considered for four variables. If there is a chance to do further study on the determinants of human development index (HDI), it would be great to include the analyze the impact of trade per capital (T-pc), export per capita (Expt-pc), import per capita (Impt-pc), Consumer Price Index (CPI) and membership of World Trade Organization (WTO), estimated gross national income per capita (male, female), gender development index (GDI), women's empowerment (Socio-economic) empowerment , carbon dioxide emissions ((per capita (tonnes) & Kg per 2011 PPP $ of GDP)) , Forest area (% of total land area) & (change %), Fresh water withdrawals (% of total land area), Environmental threats, mortality rate attributed to/ unsafe water sanitation and hygiene services, etc…, especially on human development as measured by the Human Development Index (HDI). By using panel data from the ASEAN Countries of another period.

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APPENDIX

APPENDIX A-1

Table (2.1)

Population Growth (annual %) in ASEAN Countries (2000-2019)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	2.11	2.24	1.38	1.67	2.32	1.16	2.16	1.73	1.04	1.10
2001	2.04	2.04	1.37	1.60	2.20	1.08	2.13	2.70	0.93	1.04
2002	1.96	1.86	1.36	1.53	2.08	1.01	2.10	0.91	0.83	0.98
2003	1.86	1.71	1.35	1.51	2.01	0.93	2.05	-1.47	0.75	0.94
2004	1.72	1.62	1.34	1.52	1.97	0.86	1.98	1.25	0.69	0.92
2005	1.57	1.57	1.34	1.57	1.97	0.79	1.89	2.35	0.65	0.92
2006	1.40	1.53	1.33	1.63	1.97	0.71	1.79	3.13	0.60	0.93
2007	1.26	1.49	1.32	1.68	1.96	0.65	1.71	4.17	0.56	0.94
2008	1.18	1.48	1.32	1.70	1.91	0.62	1.66	5.32	0.53	0.96
2009	1.17	1.50	1.33	1.67	1.82	0.64	1.65	3.02	0.50	0.98
2010	1.23	1.54	1.34	1.62	1.69	0.70	1.67	1.77	0.49	1.00
2011	1.29	1.59	1.35	1.56	1.56	0.77	1.69	2.08	0.48	1.02
2012	1.34	1.63	1.35	1.52	1.45	0.83	1.70	2.45	0.47	1.04
2013	1.35	1.65	1.34	1.49	1.37	0.85	1.69	1.62	0.45	1.05
2014	1.32	1.64	1.31	1.49	1.34	0.82	1.65	1.30	0.43	1.05
2015	1.25	1.60	1.27	1.52	1.34	0.76	1.58	1.19	0.40	1.04
2016	1.17	1.57	1.22	1.54	1.36	0.69	1.51	1.30	0.37	1.03
2017	1.11	1.53	1.18	1.55	1.36	0.63	1.45	0.09	0.35	1.02
2018	1.05	1.49	1.13	1.55	1.35	0.61	1.40	0.47	0.32	0.99
2019	1.01	1.45	1.10	1.52	1.33	0.63	1.36	1.14	0.28	0.95

Source: World Development Indicators, World data Bank

Table (2.1,a)

Population of ASEAN Countries for (2000-2019)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia
2000	333166	12155241	211513822	5323701	23194252
2001	340037	12405411	214427419	5409584	23709115
2002	346777	12637719	217357790	5493247	24208391
2003	353295	12856171	220309473	5576640	24698821
2004	359434	13066475	223285666	5662199	25190647
2005	365112	13273355	226289468	5751675	25690615
2006	370262	13477705	229318262	5846075	26201954
2007	374967	13679953	232374239	5944950	26720367
2008	379418	13883835	235469755	6046630	27236003
2009	383902	14093605	238620554	6148621	27735038
2010	388634	14312205	241834226	6249168	28208028
2011	393687	14541421	245115988	6347564	28650962
2012	398997	14780454	248451714	6444527	29068189
2013	404414	15026330	251805314	6541302	29468923
2014	409778	15274506	255128076	6639763	29866606
2015	414914	15521435	258383257	6741160	30270965
2016	419791	15766290	261556386	6845848	30684652
2017	424481	16009413	264650969	6953031	31104655
2018	428960	16249795	267670549	7061498	31528033
2019	433296	16486542	270625567	7169456	31949789

Source: World Development Indicators, World data Bank.

Table (2.1,b)

Population of ASEAN Countries for (2000-2019)

Year	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	46719698	77991757	4027887	62952639	79910411
2001	47225119	79672869	4138012	63539190	80742500
2002	47702163	81365260	4175950	64069093	81534406
2003	48148907	83051970	4114826	64549867	82301650
2004	48564489	84710544	4166664	64995303	83062819
2005	48949931	86326251	4265762	65416189	83832662
2006	49301049	87888675	4401365	65812540	84617545
2007	49621479	89405482	4588599	66182064	85419588
2008	49929642	90901967	4839396	66530980	86243424
2009	50250366	92414161	4987573	66866834	87092250
2010	50600827	93966784	5076732	67195032	87967655
2011	50990612	95570049	5183688	67518379	88871384
2012	51413703	97212639	5312437	67835969	89801926
2013	51852464	98871558	5399162	68144519	90752593
2014	52280816	100513137	5469724	68438748	91713850
2015	52680724	102113206	5535002	68714519	92677082
2016	53045199	103663812	5607283	68971313	93640435
2017	53382521	105172921	5612253	69209817	94600643
2018	53708318	106651394	5638676	69428454	95545959
2019	54045422	108116622	5703569	69625581	96462108

Source: World Development Indicators, World data Bank.

APPENDIX A-2

Table (2.2)

Human Development Index of ASEAN countries from (2000- 2019)

year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	0.805	0.419	0.604	0.466	0.724	0.424	0.631	0.818	0.649	0.578
2001	0.806	0.434	0.61	0.471	0.722	0.432	0.634	0.822	0.657	0.586
2002	0.809	0.453	0.616	0.48	0.724	0.441	0.639	0.83	0.665	0.594
2003	0.815	0.466	0.623	0.488	0.731	0.451	0.643	0.839	0.674	0.603
2004	0.82	0.478	0.629	0.496	0.734	0.46	0.653	0.846	0.683	0.612
2005	0.824	0.49	0.633	0.505	0.732	0.47	0.656	0.869	0.693	0.616
2006	0.827	0.502	0.643	0.511	0.738	0.479	0.657	0.872	0.694	0.624
2007	0.827	0.516	0.644	0.521	0.751	0.49	0.663	0.879	0.71	0.632
2008	0.828	0.521	0.648	0.528	0.762	0.501	0.667	0.884	0.714	0.639
2009	0.831	0.524	0.659	0.539	0.766	0.512	0.666	0.885	0.718	0.65
2010	0.846	0.533	0.662	0.543	0.774	0.526	0.669	0.911	0.720	0.655
2011	0.852	0.54	0.669	0.554	0.776	0.533	0.666	0.917	0.729	0.662
2012	0.86	0.546	0.677	0.563	0.779	0.54	0.671	0.92	0.733	0.668
2013	0.863	0.553	0.682	0.573	0.783	0.547	0.676	0.922	0.737	0.675
2014	0.864	0.558	0.686	0.582	0.787	0.552	0.679	0.924	0.738	0.678
2015	0.865	0.563	0.689	0.586	0.789	0.556	0.682	0.925	0.74	0.683
2016	0.852	0.576	0.691	0.598	0.799	0.574	0.696	0.93	0.748	0.689
2017	0.853	0.582	0.694	0.601	0.802	0.578	0.699	0.932	0.755	0.694
2018	0.845	0.581	0.707	0.604	0.804	0.584	0.712	0.935	0.765	0.693
2019	0.838	0.594	0.718	0.613	0.810	0.583	0.718	0.938	0.777	0.704

Source: World Development Indicators, World data Bank.

APPENDIX A-3

Table (2.3)

Inflation Rate of ASEAN Countries from (2000- 2019) (Percent)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	29.02	-4.28	20.45	24.80	8.86	11.03	5.82	3.86	1.33	3.41
2001	-5.59	2.65	14.30	8.87	-1.58	14.37	5.62	-1.81	1.92	2.62
2002	0.37	0.71	5.90	6.32	3.13	34.61	4.23	-0.90	1.69	4.70
2003	6.10	1.80	5.49	13.45	3.30	28.72	3.19	-1.80	2.15	7.11
2004	15.89	4.82	8.55	10.69	6.01	10.72	5.89	3.96	3.57	8.43
2005	18.77	6.08	14.33	8.64	8.86	12.01	5.91	1.90	5.09	18.81
2006	10.05	4.63	14.09	10.81	3.98	20.37	5.11	1.84	5.10	8.57
2007	1.12	6.52	11.26	7.44	4.88	22.59	3.16	5.92	2.47	9.63
2008	12.69	12.25	18.15	8.86	10.39	17.76	7.18	-1.38	5.13	22.67
2009	-22.09	2.50	8.27	-2.93	-5.99	8.76	2.74	2.95	0.19	6.22
2010	16.69	3.12	15.26	9.20	7.27	6.03	4.37	1.11	4.08	12.07
2011	20.18	3.36	7.47	10.47	5.41	8.68	3.92	1.17	3.74	21.42
2012	1.22	1.44	3.75	7.53	1.00	6.44	1.99	0.50	1.91	9.08
2013	-2.82	0.78	4.97	6.47	0.17	3.80	2.06	-0.43	1.78	4.04
2014	-1.85	2.63	5.44	5.73	2.47	4.27	3.05	-0.27	1.44	3.70
2015	-17.61	1.79	3.98	2.35	1.22	8.37	-0.72	3.07	0.72	-1.72
2016	-9.17	3.48	2.44	3.02	1.66	-2.65	1.28	0.44	2.64	1.82
2017	4.95	3.34	4.29	1.85	3.78	5.37	2.32	2.80	1.90	4.36
2018	9.22	3.11	3.82	1.92	0.62	5.45	3.74	3.51	1.43	3.41
2019	-3.34	3.24	1.60	1.20	0.07	6.27	0.70	-0.36	1.00	1.86

Source: World Development Indicators, World data Bank.

APPENDIX A-4

GDP per capita, PPP (constant 2017 international $) of ASEAN Countries for (2000-2019)

Year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia
2000	69022.88	1481.66	5689.26	2861.27	15917.06
2001	69483.90	1570.07	5816.43	2977.80	15652.01
2002	70771.60	1642.61	5996.19	3106.01	16155.60
2003	71483.18	1752.04	6198.65	3245.19	16751.41
2004	70616.62	1902.10	6423.72	3399.35	17538.49
2005	69787.82	2120.55	6699.27	3584.32	18114.14
2006	71843.52	2313.34	6974.45	3830.40	18752.55
2007	71051.71	2511.90	7319.43	4052.84	19546.99
2008	68856.16	2640.63	7657.59	4296.48	20103.50
2009	66851.12	2603.58	7906.26	4542.18	19442.99
2010	67753.42	2716.70	8286.73	4850.18	20536.37
2011	69388.81	2862.91	8680.21	5158.84	21289.26
2012	69090.34	3022.60	9080.07	5489.04	22132.22
2013	66715.69	3191.86	9457.02	5841.88	22855.95
2014	64190.82	3364.28	9801.17	6193.34	23906.23
2015	63147.48	3541.38	10149.60	6543.67	24787.82
2016	60867.29	3728.10	10531.11	6896.13	25541.77
2017	60994.53	3928.37	10935.63	7257.81	26661.51
2018	60389.18	4159.34	11371.73	7592.83	27577.38
2019	62098.01	4388.80	11812.10	7886.65	28421.46

Source: World Development Indicators, World data Bank.

APPENDIX A-5

GDP per capita, PPP (constant 2017 international $) of ASEAN Countries for (2000-2019)

Year	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	948.78	4453.76	55904.23	9809.62	3649.24
2001	1055.65	4492.72	53833.73	10053.82	3835.30
2002	1167.40	4562.76	55437.56	10583.76	4038.12
2003	1306.77	4697.49	58819.96	11260.16	4276.47
2004	1473.02	4908.06	63862.12	11886.32	4556.62
2005	1659.69	5054.24	66973.55	12304.40	4855.52
2006	1867.15	5228.32	70756.44	12837.88	5146.15
2007	2086.99	5474.68	73992.12	13460.06	5461.28
2008	2303.80	5618.48	71464.93	13620.53	5715.36
2009	2527.39	5606.59	69430.48	13458.53	5965.16
2010	2762.61	5918.37	78115.21	14399.04	6285.14
2011	2947.66	6043.60	81258.08	14450.48	6620.01
2012	3113.01	6351.26	82805.61	15424.54	6911.74
2013	3330.47	6666.25	85400.73	15767.36	7218.92
2014	3574.03	6973.64	87616.64	15854.13	7601.86
2015	3663.14	7300.14	89160.73	16285.39	8048.70
2016	4020.24	7705.05	91146.10	16782.10	8498.81
2017	4224.55	8120.87	95310.33	17422.95	8996.38
2018	4467.86	8516.14	98336.96	18101.52	9548.70
2019	4739.71	8914.72	98283.31	18438.65	10134.26

Source: World Development Indicators, World data Bank.

APPENDIX A-6

Table (2.5)

Unemployment, total (% of total labor force) (modeled ILO estimate) of ASEAN Countries 2000-2019

year	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
2000	5.68	0.97	6.08	2.06	3.00	0.65	3.65	3.70	2.39	2.26
2001	5.78	1.03	6.08	1.94	3.53	0.67	3.70	3.76	2.60	2.76
2002	5.94	1.10	6.60	1.80	3.48	0.67	3.63	5.65	1.82	2.12
2003	6.01	1.11	6.66	1.66	3.61	0.66	3.53	5.93	1.54	2.25
2004	6.02	1.13	7.30	1.51	3.54	0.67	3.55	5.84	1.51	2.14
2005	6.13	1.13	7.94	1.35	3.53	0.67	3.80	5.59	1.35	2.10
2006	6.41	1.21	7.55	1.19	3.31	0.68	4.05	4.48	1.22	2.09
2007	6.33	1.26	8.06	1.10	3.23	0.69	3.43	3.90	1.18	2.03
2008	6.35	0.82	7.21	0.97	3.32	0.71	3.72	3.96	1.18	1.93
2009	6.47	0.58	6.11	0.85	3.66	0.71	3.86	5.86	0.95	1.74
2010	6.77	0.77	5.61	0.71	3.39	0.72	3.61	4.12	0.62	1.11
2011	6.94	0.58	5.15	0.73	3.05	0.77	3.59	3.89	0.66	1.00
2012	6.92	0.51	4.47	0.74	3.10	0.75	3.50	3.72	0.58	1.03
2013	6.88	0.44	4.34	0.75	3.16	0.75	3.50	3.86	0.25	1.32
2014	6.97	0.69	4.05	0.76	2.88	0.75	3.60	3.74	0.58	1.26
2015	7.78	0.39	4.51	0.78	3.10	0.77	3.07	3.79	0.60	1.85
2016	8.38	0.72	4.30	0.79	3.44	1.18	2.70	4.08	0.69	1.85
2017	9.32	0.14	3.88	0.81	3.41	1.56	2.55	4.20	0.83	1.87
2018	8.70	0.14	4.40	0.83	3.30	0.87	2.34	3.64	0.77	1.16
2019	6.92	0.15	3.62	0.85	3.26	0.50	2.24	3.10	0.72	2.04

Source: World Development Indicators, World data Bank.

APPENDIX A-7

Table (1) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Brunei (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Brunei	1	0.805	2.11	29.02	69022.88	5.68
2001	Brunei	1	0.872	2.04	-5.59	69483.90	5.78
2002	Brunei	1	0.867	1.96	0.37	70771.60	5.94
2003	Brunei	1	0.866	1.86	6.10	71483.18	6.01
2004	Brunei	1	0.871	1.72	15.89	70616.62	6.02
2005	Brunei	1	0.917	1.57	18.77	69787.82	6.13
2006	Brunei	1	0.919	1.40	10.05	71843.52	6.41
2007	Brunei	1	0.920	1.26	1.12	71051.71	6.33
2008	Brunei	1	0.841	1.18	12.69	68856.16	6.35
2009	Brunei	1	0.845	1.17	-22.09	66851.12	6.47
2010	Brunei	1	0.846	1.23	16.69	67753.42	6.77
2011	Brunei	1	0.852	1.29	20.18	69388.81	6.94
2012	Brunei	1	0.860	1.34	1.22	69090.34	6.92
2013	Brunei	1	0.863	1.35	-2.82	66715.69	6.88
2014	Brunei	1	0.864	1.32	-1.85	64190.82	6.97
2015	Brunei	1	0.865	1.25	-17.61	63147.48	7.78
2016	Brunei	1	0.852	1.17	-9.17	60867.29	8.38
2017	Brunei	1	0.853	1.11	4.95	60994.53	9.32
2018	Brunei	1	0.845	1.05	9.22	60389.18	8.70
2019	Brunei	1	0.838	1.01	-3.34	62098.01	6.92

Source: World Development Indicators, World data Bank.

APPENDIX A-8

Table (2) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Cambodia (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Cambodia	2	0.419	2.24	-4.28	1481.66	0.97
2001	Cambodia	2	0.556	2.04	2.65	1570.07	1.03
2002	Cambodia	2	0.568	1.86	0.71	1642.61	1.10
2003	Cambodia	2	0.571	1.71	1.80	1752.04	1.11
2004	Cambodia	2	0.583	1.62	4.82	1902.10	1.13
2005	Cambodia	2	0.575	1.57	6.08	2120.55	1.13
2006	Cambodia	2	0.584	1.53	4.63	2313.34	1.21
2007	Cambodia	2	0.593	1.49	6.52	2511.90	1.26
2008	Cambodia	2	0.520	1.48	12.25	2640.63	0.82
2009	Cambodia	2	0.519	1.50	2.50	2603.58	0.58
2010	Cambodia	2	0.533	1.54	3.12	2716.70	0.77
2011	Cambodia	2	0.540	1.59	3.36	2862.91	0.58
2012	Cambodia	2	0.546	1.63	1.44	3022.60	0.51
2013	Cambodia	2	0.553	1.65	0.78	3191.86	0.44
2014	Cambodia	2	0.558	1.64	2.63	3364.28	0.69
2015	Cambodia	2	0.563	1.60	1.79	3541.38	0.39
2016	Cambodia	2	0.576	1.57	3.48	3728.10	0.72
2017	Cambodia	2	0.582	1.53	3.34	3928.37	0.14
2018	Cambodia	2	0.581	1.49	3.11	4159.34	0.14
2019	Cambodia	2	0.594	1.45	3.24	4388.80	0.15

Source: World Development Indicators, World data Bank.

APPENDIX A-9

Table (3) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Indonesia (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Indonesia	3	0.604	1.38	20.45	5689.26	6.08
2001	Indonesia	3	0.682	1.37	14.30	5816.43	6.08
2002	Indonesia	3	0.692	1.36	5.90	5996.19	6.60
2003	Indonesia	3	0.697	1.35	5.49	6198.65	6.66
2004	Indonesia	3	0.711	1.34	8.55	6423.72	7.30
2005	Indonesia	3	0.723	1.34	14.33	6699.27	7.94
2006	Indonesia	3	0.729	1.33	14.09	6974.45	7.55
2007	Indonesia	3	0.734	1.32	11.26	7319.43	8.06
2008	Indonesia	3	0.645	1.32	18.15	7657.59	7.21
2009	Indonesia	3	0.656	1.33	8.27	7906.26	6.11
2010	Indonesia	3	0.662	1.34	15.26	8286.73	5.61
2011	Indonesia	3	0.669	1.35	7.47	8680.21	5.15
2012	Indonesia	3	0.677	1.35	3.75	9080.07	4.47
2013	Indonesia	3	0.682	1.34	4.97	9457.02	4.34
2014	Indonesia	3	0.686	1.31	5.44	9801.17	4.05
2015	Indonesia	3	0.689	1.27	3.98	10149.60	4.51
2016	Indonesia	3	0.691	1.22	2.44	10531.11	4.30
2017	Indonesia	3	0.694	1.18	4.29	10935.63	3.88
2018	Indonesia	3	0.707	1.13	3.82	11371.73	4.40
2019	Indonesia	3	0.718	1.10	1.60	11812.10	3.62

Source: World Development Indicators, World data Bank.

APPENDIX A-10

Table (4) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Lao PDR (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Lao PDR	4	0.466	1.67	24.80	2861.27	2.06
2001	Lao PDR	4	0.525	1.60	8.87	2977.80	1.94
2002	Lao PDR	4	0.534	1.53	6.32	3106.01	1.80
2003	Lao PDR	4	0.545	1.51	13.45	3245.19	1.66
2004	Lao PDR	4	0.553	1.52	10.69	3399.35	1.51
2005	Lao PDR	4	0.607	1.57	8.64	3584.32	1.35
2006	Lao PDR	4	0.613	1.63	10.81	3830.40	1.19
2007	Lao PDR	4	0.619	1.68	7.44	4052.84	1.10
2008	Lao PDR	4	0.525	1.70	8.86	4296.48	0.97
2009	Lao PDR	4	0.535	1.67	-2.93	4542.18	0.85
2010	Lao PDR	4	0.542	1.62	9.20	4850.18	0.71
2011	Lao PDR	4	0.554	1.56	10.47	5158.84	0.73
2012	Lao PDR	4	0.563	1.52	7.53	5489.04	0.74
2013	Lao PDR	4	0.573	1.49	6.47	5841.88	0.75
2014	Lao PDR	4	0.582	1.49	5.73	6193.34	0.76
2015	Lao PDR	4	0.586	1.52	2.35	6543.67	0.78
2016	Lao PDR	4	0.598	1.54	3.02	6896.13	0.79
2017	Lao PDR	4	0.601	1.55	1.85	7257.81	0.81
2018	Lao PDR	4	0.604	1.55	1.92	7592.83	0.83
2019	Lao PDR	4	0.613	1.52	1.20	7886.65	0.85

Source: World Development Indicators, World data Bank.

APPENDIX A-11

Table (5) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Malaysia (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Malaysia	5	0.724	2.32	8.86	15917.06	3.00
2001	Malaysia	5	0.790	2.20	-1.58	15652.01	3.53
2002	Malaysia	5	0.793	2.08	3.13	16155.60	3.48
2003	Malaysia	5	0.796	2.01	3.30	16751.41	3.61
2004	Malaysia	5	0.805	1.97	6.01	17538.49	3.54
2005	Malaysia	5	0.821	1.97	8.86	18114.14	3.53
2006	Malaysia	5	0.825	1.97	3.98	18752.55	3.31
2007	Malaysia	5	0.829	1.96	4.88	19546.99	3.23
2008	Malaysia	5	0.756	1.91	10.39	20103.50	3.32
2009	Malaysia	5	0.764	1.82	-5.99	19442.99	3.66
2010	Malaysia	5	0.774	1.69	7.27	20536.37	3.39
2011	Malaysia	5	0.776	1.56	5.41	21289.26	3.05
2012	Malaysia	5	0.779	1.45	1.00	22132.22	3.10
2013	Malaysia	5	0.783	1.37	0.17	22855.95	3.16
2014	Malaysia	5	0.787	1.34	2.47	23906.23	2.88
2015	Malaysia	5	0.789	1.34	1.22	24787.82	3.10
2016	Malaysia	5	0.799	1.36	1.66	25541.77	3.44
2017	Malaysia	5	0.802	1.36	3.78	26661.51	3.41
2018	Malaysia	5	0.804	1.35	0.62	27577.38	3.30
2019	Malaysia	5	0.810	1.33	0.07	28421.46	3.26

Source: World Development Indicators, World data Bank.

APPENDIX A-12

Table (6) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Myanmar (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Myanmar	6	0.424	1.16	11.03	948.78	0.65
2001	Myanmar	6	0.549	1.08	14.37	1055.65	0.67
2002	Myanmar	6	0.551	1.01	34.61	1167.40	0.67
2003	Myanmar	6	0.578	0.93	28.72	1306.77	0.66
2004	Myanmar	6	0.581	0.86	10.72	1473.02	0.67
2005	Myanmar	6	0.583	0.79	12.01	1659.69	0.67
2006	Myanmar	6	0.584	0.71	20.37	1867.15	0.68
2007	Myanmar	6	0.586	0.65	22.59	2086.99	0.69
2008	Myanmar	6	0.504	0.62	17.76	2303.80	0.71
2009	Myanmar	6	0.515	0.64	8.76	2527.39	0.71
2010	Myanmar	6	0.526	0.70	6.03	2762.61	0.72
2011	Myanmar	6	0.533	0.77	8.68	2947.66	0.77
2012	Myanmar	6	0.540	0.83	6.44	3113.01	0.75
2013	Myanmar	6	0.547	0.85	3.80	3330.47	0.75
2014	Myanmar	6	0.552	0.82	4.27	3574.03	0.75
2015	Myanmar	6	0.556	0.76	8.37	3663.14	0.77
2016	Myanmar	6	0.574	0.69	-2.65	4020.24	1.18
2017	Myanmar	6	0.578	0.63	5.37	4224.55	1.56
2018	Myanmar	6	0.584	0.61	5.45	4467.86	0.87
2019	Myanmar	6	0.583	0.63	6.27	4739.71	0.50

Source: World Development Indicators, World data Bank.

APPENDIX A-13

Table (7) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Philippines (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Philippines	7	0.631	2.16	5.82	4453.76	3.65
2001	Philippines	7	0.751	2.13	5.62	4492.72	3.70
2002	Philippines	7	0.753	2.10	4.23	4562.76	3.63
2003	Philippines	7	0.758	2.05	3.19	4697.49	3.53
2004	Philippines	7	0.763	1.98	5.89	4908.06	3.55
2005	Philippines	7	0.744	1.89	5.91	5054.24	3.80
2006	Philippines	7	0.747	1.79	5.11	5228.32	4.05
2007	Philippines	7	0.751	1.71	3.16	5474.68	3.43
2008	Philippines	7	0.661	1.66	7.18	5618.48	3.72
2009	Philippines	7	0.662	1.65	2.74	5606.59	3.86
2010	Philippines	7	0.669	1.67	4.37	5918.37	3.61
2011	Philippines	7	0.666	1.69	3.92	6043.60	3.59
2012	Philippines	7	0.671	1.70	1.99	6351.26	3.50
2013	Philippines	7	0.676	1.69	2.06	6666.25	3.50
2014	Philippines	7	0.679	1.65	3.05	6973.64	3.60
2015	Philippines	7	0.682	1.58	-0.72	7300.14	3.07
2016	Philippines	7	0.696	1.51	1.28	7705.05	2.70
2017	Philippines	7	0.699	1.45	2.32	8120.87	2.55
2018	Philippines	7	0.712	1.40	3.74	8516.14	2.34
2019	Philippines	7	0.718	1.36	0.70	8914.72	2.24

Source: World Development Indicators, World data Bank.

APPENDIX A-14

Table (8) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Singapore (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Singapore	8	0.818	1.73	3.86	55904.23	3.70
2001	Singapore	8	0.884	2.70	-1.81	53833.73	3.76
2002	Singapore	8	0.902	0.91	-0.90	55437.56	5.65
2003	Singapore	8	0.907	-1.47	-1.80	58819.96	5.93
2004	Singapore	8	0.916	1.25	3.96	63862.12	5.84
2005	Singapore	8	0.922	2.35	1.90	66973.55	5.59
2006	Singapore	8	0.942	3.13	1.84	70756.44	4.48
2007	Singapore	8	0.944	4.17	5.92	73992.12	3.90
2008	Singapore	8	0.887	5.32	-1.38	71464.93	3.96
2009	Singapore	8	0.889	3.02	2.95	69430.48	5.86
2010	Singapore	8	0.911	1.77	1.11	78115.21	4.12
2011	Singapore	8	0.917	2.08	1.17	81258.08	3.89
2012	Singapore	8	0.920	2.45	0.50	82805.61	3.72
2013	Singapore	8	0.922	1.62	-0.43	85400.73	3.86
2014	Singapore	8	0.924	1.30	-0.27	87616.64	3.74
2015	Singapore	8	0.925	1.19	3.07	89160.73	3.79
2016	Singapore	8	0.930	1.30	0.44	91146.10	4.08
2017	Singapore	8	0.932	0.09	2.80	95310.33	4.20
2018	Singapore	8	0.936	0.47	3.51	98336.96	3.64
2019	Singapore	8	0.938	1.14	-0.36	98283.31	3.10

Source: World Development Indicators, World data Bank.

APPENDIX A-15

Table (9) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Thailand (2000-2019)

Year	Country	Code	HDI	Population	Inflation rate	GDP per capita	Unemployment rate
2000	Thailand	9	0.649	1.04	1.33	9809.62	2.39
2001	Thailand	9	0.768	0.93	1.92	10053.82	2.60
2002	Thailand	9	0.768	0.83	1.69	10583.76	1.82
2003	Thailand	9	0.778	0.75	2.15	11260.16	1.54
2004	Thailand	9	0.784	0.69	3.57	11886.32	1.51
2005	Thailand	9	0.781	0.65	5.09	12304.40	1.35
2006	Thailand	9	0.786	0.60	5.10	12837.88	1.22
2007	Thailand	9	0.783	0.56	2.47	13460.06	1.18
2008	Thailand	9	0.706	0.53	5.13	13620.53	1.18
2009	Thailand	9	0.711	0.50	0.19	13458.53	0.95
2010	Thailand	9	0.720	0.49	4.08	14399.04	0.62
2011	Thailand	9	0.729	0.48	3.74	14450.48	0.66
2012	Thailand	9	0.733	0.47	1.91	15424.54	0.58
2013	Thailand	9	0.737	0.45	1.78	15767.36	0.25
2014	Thailand	9	0.738	0.43	1.44	15854.13	0.58
2015	Thailand	9	0.740	0.40	0.72	16285.39	0.60
2016	Thailand	9	0.748	0.37	2.64	16782.10	0.69
2017	Thailand	9	0.755	0.35	1.90	17422.95	0.83
2018	Thailand	9	0.765	0.32	1.43	18101.52	0.77
2019	Thailand	9	0.777	0.28	1.00	18438.65	0.72

Source: World Development Indicators, World data Bank.

APPENDIX A-16

Table (10) HDI, Population growth, Inflation rate, GDP per capita, Unemployment rate values of Vietnam (2000-2019)

Year	Country	Code	HDI	Population growth	Inflation rate	GDP per capita	Unemployment rate
2000	Vietnam	10	0.578	1.10	3.41	3649.24	2.26
2001	Vietnam	10	0.688	1.04	2.62	3835.30	2.76
2002	Vietnam	10	0.691	0.98	4.70	4038.12	2.12
2003	Vietnam	10	0.704	0.94	7.11	4276.47	2.25
2004	Vietnam	10	0.709	0.92	8.43	4556.62	2.14
2005	Vietnam	10	0.715	0.92	18.81	4855.52	2.10
2006	Vietnam	10	0.720	0.93	8.57	5146.15	2.09
2007	Vietnam	10	0.725	0.94	9.63	5461.28	2.03
2008	Vietnam	10	0.641	0.96	22.67	5715.36	1.93
2009	Vietnam	10	0.647	0.98	6.22	5965.16	1.74
2010	Vietnam	10	0.655	1.00	12.07	6285.14	1.11
2011	Vietnam	10	0.662	1.02	21.42	6620.01	1.00
2012	Vietnam	10	0.668	1.04	9.08	6911.74	1.03
2013	Vietnam	10	0.675	1.05	4.04	7218.92	1.32
2014	Vietnam	10	0.678	1.05	3.70	7601.86	1.26
2015	Vietnam	10	0.683	1.04	-1.72	8048.70	1.85
2016	Vietnam	10	0.689	1.03	1.82	8498.81	1.85
2017	Vietnam	10	0.694	1.02	4.36	8996.38	1.87
2018	Vietnam	10	0.693	0.99	3.41	9548.70	1.16
2019	Vietnam	10	0.704	0.95	1.86	10134.26	2.04

Source: World Development Indicators, World data Bank.

```
. regress hdi popgrowth inf gdp unem
```

Source	SS	df	MS	Number of obs	=	200
				F(4, 195)	=	139.39
Model	2.28962496	4	.572406241	Prob > F	=	0.0000
Residual	.80079491	195	.004106641	R-squared	=	0.7409
				Adj R-squared	=	0.7356
Total	3.09041988	199	.015529748	Root MSE	=	.06408

hdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
popgrowth	-.0077373	.0072292	-1.07	0.286	-.0219947	.0065201
inf	-.0023202	.0006829	-3.40	0.001	-.0036671	-.0009733
gdp	3.05e-06	2.18e-07	14.01	0.000	2.62e-06	3.48e-06
unem	.0150128	.0025987	5.78	0.000	.0098875	.020138
_cons	.6211565	.0121724	51.03	0.000	.59715	.645163

Fixed-effects (within) regression — Number of obs = 200

Group variable: Code — Number of groups = 10

R-sq: — Obs per group:

within = 0.0677 — min = 20

between = 0.7839 — avg = 20.0

overall = 0.7280 — max = 20

F(4,186) = 3.38

corr(u_i, Xb) = 0.6620 — Prob > F = 0.0107

hdi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
popgrowth	-.0008754	.005027	-0.17	0.862	-.0107926	.0090418
inf	-.0003816	.0003912	-0.98	0.331	-.0011532	.0003901
gdp	1.84e-06	5.50e-07	3.35	0.001	7.57e-07	2.93e-06
unem	.0050038	.0038304	1.31	0.193	-.0025529	.0125605
_cons	.6560894	.0222752	29.45	0.000	.6121449	.700034
sigma_u	.07901851					
sigma_e	.03352742					
rho	.84743673	(fraction of variance due to u_i)				

F test that all u_i=0: F(9, 186) = 58.49 — Prob > F = 0.0000

Random-effects GLS regression — Number of obs = 200
Group variable: Code — Number of groups = 10

R-sq: — Obs per group:
within = 0.0661 — min = 20
between = 0.7844 — avg = 20.0
overall = 0.7295 — max = 20

Wald chi2(4) = 44.72
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

hdi	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
popgrowth	.0011128	.0049327	0.23	0.822	-.0085551	.0107807
inf	-.0004648	.0003946	-1.18	0.239	-.0012383	.0003087
gdp	2.57e-06	4.07e-07	6.33	0.000	1.78e-06	3.37e-06
unem	.0090811	.0032474	2.80	0.005	.0027162	.0154459
_cons	.6266017	.024192	25.90	0.000	.5791862	.6740173
sigma_u	.05511784					
sigma_e	.03352742					
rho	.72992054	(fraction of variance due to u_i)				

Breusch and Pagan Lagrangian multiplier test for random effects

hdi[Code,t] = Xb + u[Code] + e[Code,t]

Estimated results:

	Var	sd = sqrt(Var)
hdi	.0155297	.1246184
e	.0011241	.0335274
u	.003038	.0551178

Test: Var(u) = 0
chibar2(01) = 852.30
Prob > chibar2 = 0.0000

. hausman fe re

	Coefficients			
	(b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
popgrowth	.0011128	.0011128	0	0
inf	-.0004648	-.0004648	0	0
gdp	2.57e-06	2.57e-06	0	0
unem	.0090811	.0090811	0	0

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(0) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.00

Prob>chi2 = .

(V_b-V_B is not positive definite)

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: popgrowth inf gdp unem

chi2(4) = 11.35

Prob > chi2 = 0.0229

Cross-sectional time-series FGLS regression

Coefficients: generalized least squares
Panels: homoskedastic
Correlation: no autocorrelation

Estimated covariances	= 1	Number of obs	= 200
Estimated autocorrelations	= 0	Number of groups	= 10
Estimated coefficients	= 5	Time periods	= 20
		Wald chi2(4)	= 571.84
Log likelihood	= 268.2591	Prob > chi2	= 0.0000

hdi	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
popgrowth	-.0077373	.0071382	-1.08	0.278	-.0217279	.0062534
inf	-.0023202	.0006744	-3.44	0.001	-.003642	-.0009985
gdp	3.05e-06	2.15e-07	14.19	0.000	2.63e-06	3.48e-06
unem	.0150128	.0025661	5.85	0.000	.0099834	.0200422
_cons	.6211565	.0120193	51.68	0.000	.5975991	.6447139

. Durbin-Watson 0.407

. vif

Variable	VIF	1/VIF
gdp	1.63	0.615369
unem	1.57	0.638709
inf	1.07	0.935734
popgrowth	1.06	0.947586
Mean VIF	1.33	

.